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ECONOMIC ATLAS

of

MANITOBA

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ECONOMIC ATLAS

of

MANITOBA

Editor

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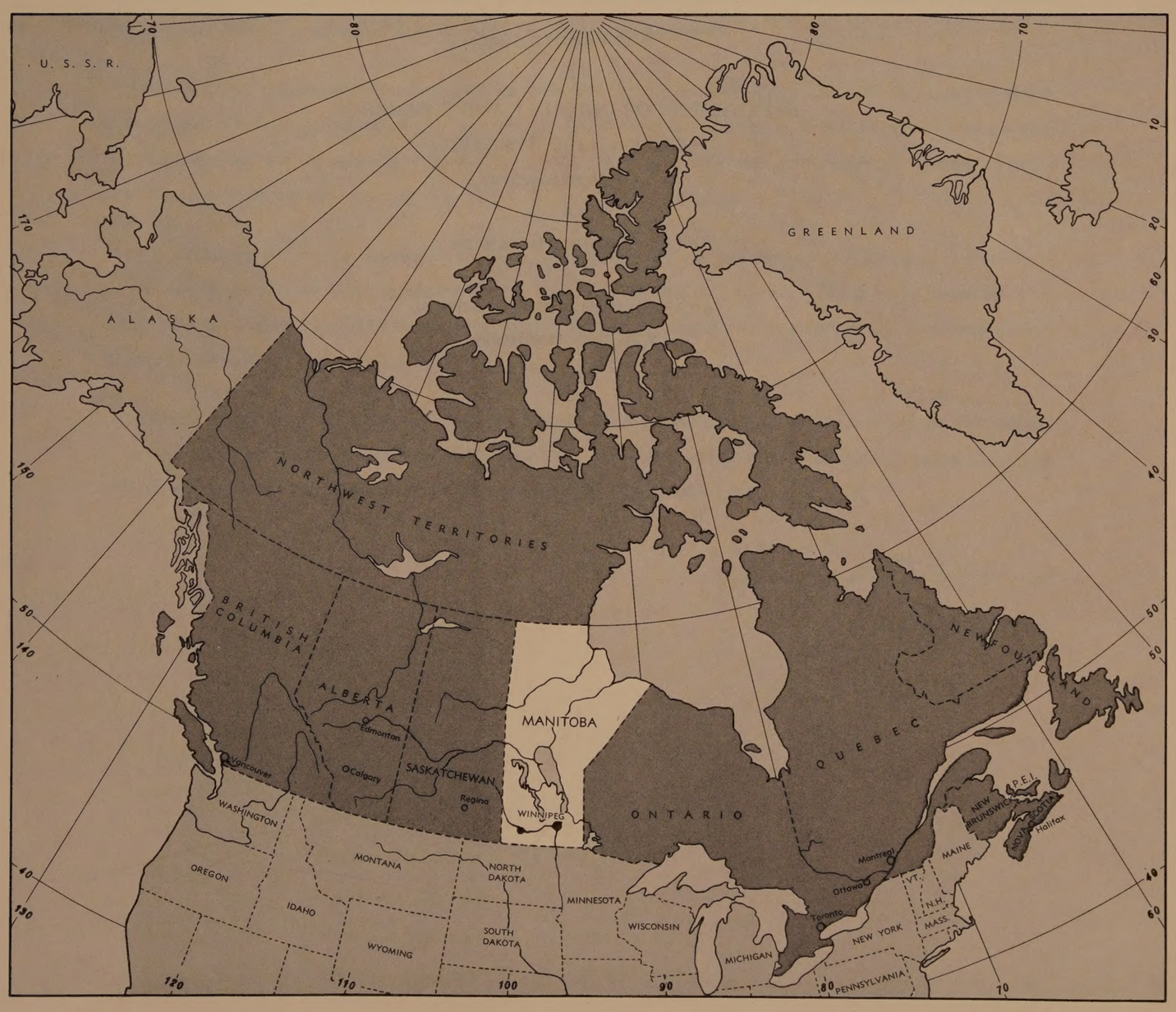

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Province of Manitoba

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PREFACE

In this volume, first of its kind in the history of our province, we present Manitoba in maps. I can think of no better way to show the features of the land and the people who live on it and develop its resources.

It is our hope that this Economic Atlas of Manitoba will help to give Manitobans a better understanding and appreciation of their province. We are also anxious to acquaint others with the outstanding development opportunities within the 250,000 square miles of our territory. Manitoba is richly endowed with materials that modern industry needs and road development programs are continually opening up new possibilities in our vast northern areas.

Physically and economically, Manitoba is the link between Canada's East and West. Although often classified as one of the Prairie Provinces, Manitoba is only part prairie, for it lies across the line of contact between the mineral-rich Precambrian Shield and the agricultural Great Plains, whose sedimentary formations have just begun to release Western Canada's plentiful oil and gas resources.

The diversity of Manitoba's economy is increasing. Not many years ago, agriculture provided the principal source of income, and the contribution of manufacturing and the northern areas was insignificant. Today, rising expenditures on capital construction throughout the province attest to the vitality of growing manufacturing industries and accelerated natural resource development.

It seems appropriate that the Economic Atlas of Manitoba should appear at this time, when there is world-wide interest in economic development and more rational use of resources. May I commend its study to all who seek further knowledge of the sure growth and many opportunities for development within this Canadian province.

Premier of Manitoba.

FOREWORD

"Any man who is cultured, or who prides himself on being so, must have an atlas, must consult it frequently, and - better still - must ponder the lessons to be drawn from it."

Andre Siegefried of L'Academie Francaise

Second of its kind in Canada, the Economic Atlas of Manitoba contains over 100 separate maps covering a wide range of subject matter essential to the understanding, use and future development of Manitoba's resources. The maps are all original, compiled from the latest sources available. Unlike some, this Atlas is not intended merely to locate places and provide names. It is an unfolding of the geography of the province by first establishing the physical basis of resource development, followed by an analysis of population and settlement and culminating in a variety of maps dealing with resource utilization.

No better medium has yet been devised for the setting forth of facts pertaining to area than the map. At a glance we may secure information about the extent and distribution of our resources, and by comparing map with map we may grasp many complex relationships between various resources. In order to amplify the map, each plate is accompanied by a page of text materials some with graphs and illustrations. By presenting this variety of material it is hoped that everyone concerned with Manitoba may obtain a well-rounded appreciation of its wealth in land, people and industries.

In the preparation of this Atlas four groups of readers were kept specifically in mind. The businessman concerned with the factors of location will find in its pages a variety of information about sources of raw materials, power, labour force, population, potential markets and transportation facilities. To the planner, concerned with the best use as well as the conservation of the natural wealth of the province, it will act as a ready framework to guide the general lines of development. To those concerned with recreation, the tourist and the sportsman, certain maps will prove a guide to the maximum enjoyment of our resources in forest, fish and wild life. To students in high schools and universities, many of whom will be concerned with the future use and disposition of this province's resources, it will provide a wide range of geographical information.

The Atlas is concerned with the mapping of resources, not simply those of economic value but the total resources of landscape. Part one deals with the physical resources, for these set the stage upon which the drama of development is to be enacted according to the ingenuity of the people. While it is necessary for ease of comprehension to categorize the physical elements into landforms, climate, soils, natural vegetation, etc., a proper understanding of the natural setting will not be achieved without viewing them in their complex inter-relationships. The reader to some extent is made aware of this by constant use of cross-references.

The second part deals with human resources. Underlying all the great domestic issues of our time are the facts of man's relation to the earth. This relation is measured in density and distribution, in settlement types and patterns, in ethnic background and cultural outlook. Man is the key to resource development; he alone is the determining agent. Nature offers a limited range of possibilities, but man makes the decision as to their disposition according to his cultural background.

Part three is concerned with resource development and utilization. Traditionally, Manitoba is an agricultural province. It was settled by land-hungry people from other parts of this continent and over-crowded Europe. Initially, towns were small and the processing of raw materials was carried on outside the boundaries of the province. Then the decade of 1941-51 saw the urban population balance the rural in numbers, while today the ratio is 60 percent in favour of the urban with half the people living in metropolitan Winnipeg. These changes reflect the migration from farm to city resulting from a revolution in agricultural methods brought about by modern technology. Urbanization also means that more raw materials are being processed within Manitoba; manufacturing now provides 40 percent of the total net income. Nevertheless local primary industry functions increasingly as the essential reservoir of raw materials. This is the message of part three.

In concluding this foreword, I would like to pay tribute to the foresight of Deputy Minister, R. E. Grose who first proposed the Economic Atlas of Manitoba. He has followed through every stage of its production with enthusiasm, convinced that a sound development of industry must be founded on a comprehensive understanding of the resources of this province. The editor also wishes to acknowledge the use of the facilities of the Department of Industry and Commerce and the generous co-operation of its staff.

T. R. Weir.

Editor.

ACKNOWLEDGMENTS

The preparation of the Economic Atlas of Manitoba was undertaken for the Department of Industry and Commerce by the editor, assisted by a group of geographers, mostly from the University of Manitoba. A large share of the map compilation requiring a high standard of accuracy and scholarship was skillfully carried out by Philip Keddie, a graduate of the Geography Department. Professor John Warkentin rendered valuable assistance in compilation, especially of the historical maps, transportation and the revision of the Winnipeg maps. Cartography was commenced by Hans Hosse, continued by Fred Nammacher and carried through to completion by Geoffrey Matthews, who was responsible for most of the overlays. The Physiographic Diagram was compiled and drawn by Fred Nammacher. Climatic Relations was compiled by Robert Tutford under the direction of Professor John Borchert, and Principal Industries by John Pelletier. Professor Arthur Robinson of the University of Wisconsin assisted with valued technical advice.

The co-operation of the following departments of the Provincial Government is gratefully acknowledged: Agriculture, Mines and Natural Resources, and Municipal Affairs.

With the exceptions noted below, articles appearing on the pages of text were prepared by the following: much of Part III, Department of Industry and Commerce; Part II and Urban Growth, Professor John Warkentin; Part I together with Daytime Population and all articles on Agriculture, the Editor.

The following are acknowledged as the authors of special articles included in the above: Professor Bruce Wilson, *Geology*; C. B. Gill and Professor James Ritchie, *Natural Vegetation*; Jean Legasse, *Native Peoples*; J. F. Davies, *Tectonic Divisions*.

To Mr. Lee Pratt and Dr. Walter Erhlich of the Manitoba Soils Survey, to Michael Stubbs, Professor Clayton Gillson, John Pelletier and others who by advice, information and critical reading have made a valuable contribution to this work, the editor extends his sincere thanks.—T.R.W.

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PART ONE

Resource Base

"No study is realistic, that treats humanity as if it lived suspended in empty space instead of treading a world of minerals, forests, climates and soils."

— Isaiah Bowman.

The resource base consists of the major physical elements that blend to make up the natural landscape of Manitoba. Man's economy must necessarily reflect the total physical resources of a region, particularly when the principal extractive industry is agriculture. A modern mining industry must provide towns for its employed population and these, in turn, require careful planning in keeping with the total physical resources of the region. The decision to build roads is more than a study in economics; it, too, must take into account the complex geography of a region. The purpose of Part One is to provide the necessary physical basis on which to evaluate our economic resources and provide for future development.

Plate I shows the major relief and drainage features of the whole province based on the 8 mile sheets of the National Topographic Series. The absence of more detailed topographic information made it necessary to select a contour interval of 500 feet. Plate 2 shows the physiography by means of pictorial symbols. Relief differences form the basis of this map and it is hoped that it will dispel the illusion that Manitoba is altogether a flat plain. Plate 3 contains the Physiographic Divisions map which organizes into regions, areas having similar topography. Relief and surface deposits underlie divisional boundaries. This map forms the basis for regional studies especially those in which relief plays an important part. The Tectonic Divisions and Gravity Anomaly map should be studied in relation to the geology map. Although its application is more technical, it does bring out the significance of structure to mineralized zones. The detailed topographic map of southern Manitoba was possible because more detailed surveys have been made in the south. Nevertheless gaps occur in these and some interpolation was necessary. Scale limitations in showing contours suggested the compromise of using three intervals increasing with the degree of relief. This map highlights Manitoba's "mountains." Plate 4, the Geology map, was revised to include material from surveys since 1946. The grouping of rocks in the Precambrian is subdivided according to major types rather than according to hypothetical ages. Minor relief and drainage features and many variations in soil type are readily understood from the surface deposits (plate 5) which everywhere mask the terrain. The Soils map, plate 6, indicates zones of similar soils developed under similar environmental conditions and having similar profiles. A secondary separation of zones on the basis of texture is shown for Black Soils. The major climatic elements are set forth in the climatic series plates 7-8-9, keeping in mind conditions primarily affecting agriculture. The most recent version of Thornthwaite's system based on moisture need is included. The decision to use a physiognomic rather than a floristic classification in showing natural vegetation (plate 10) is related to the interest of the average reader. Major divisions in vegetation indicate the dominance of climate as the primary physical control. The variety of vegetation types from grassland to tundra makes Manitoba a fascinating province for botanical research.

Three scales of maps are used in this atlas based on the 20 mile map of Manitoba produced by the Provincial Surveys Branch: the full page map of Manitoba—1 inch to 39 miles: the half-page map of southern Manitoba—1 inch to 29 miles; the quarter-page map of the entire province—1 inch to 80 miles and, in later maps, a six-to-a page base of southern Manitoba on a scale of 1 inch to 47 miles. Projection: Lambert's Conformal based on standard parallels 47° 30″ and 65° 30″.

RELIEF and DRAINAGE

Many people believe that Manitoba is everywhere a flat plain. This results chiefly from the fact that most Manitobans live and travel in the southern part of the province where the relief over large areas is very slight.[1] We may journey in any direction from Winnipeg for fifty miles without experiencing a change in elevation of more than 300 feet or encountering a topographic feature of more than 50 feet above the surrounding countryside. If we travel the principal highway westward from Portage la Prairie to Brandon, we rise gradually over the old (glacial) delta of the Assiniboine River and are scarcely conscious of change in elevation or relief except for sand dunes. However, if we visit Riding Mountain and stand on the eastern rim, we observe as far as the eye can see a great lowland plain 1,000 feet below us. Similar abrupt changes in elevation occur along the eastern margins of the Duck and Porcupine Mountains and, to a lesser degree, along the face of Pembina Mountain to the south. The highest point in Manitoba is Mt. Baldy with an elevation of 2,727 feet which is also the point of maximum elevation as far west as The Coteau in Saskatchewan.

Using the 1,000 foot contour as an arbitrary division, two-thirds of Manitoba is lowland (plate 1). The flattest part, known as the Manitoba Lowland, lies between the Manitoba Escarpment on the west and the Canadian Shield on the east and has an average elevation of 850 feet. It contains Lakes Winnipeg, Winnipegosis and Manitoba together with the Red, lower Assiniboine and lower Saskatchewan Rivers. It will be noticed from plate one that these lakes are shallow. They are remnants of a much greater glacial Lake Agassiz. The local relief[2] of this lowland is generally under 25 feet with the result that large areas in the vicinity of the lakes are poorly drained, resulting in bog, swamp and marsh. The southern part referred to as the valley of the Red River, is probably the flattest area of its size in Canada and prior to settlement much of it was poorly drained.

Northeast of the Manitoba Lowland is the Nelson depression or trough whose surface slopes seaward being drained chiefly by the waters of the Nelson, Churchill and Hayes Rivers. This part of the lowland lies within the Precambrian Shield and was formed by normal stream erosion. The Nelson is by far the greatest river in the Province with a drainage area of 414,000 square miles extending from the Rocky Mountains nearly to Lake Superior and includes the Saskatchewan, Red and Winnipeg River drainage basins (map below). Local relief of the Nelson Lowland is greater than that of the Manitoba Lowland. Rivers and lakes are frequently entrenched 50 to 100 feet. Many rocky hills and morainic deposits further add to the roughness of the terrain. Erosion by the continental ice-sheet deranged the drainage resulting in a maze of lakes, swamps and streams characteristic of the Precambrian Shield in other parts of Canada. The largest of the lakes is Southern Indian (1,200 square miles) draining into the Churchill River. Unlike the lakes of the Manitoba Lowland, many occupy rock-basins and vary greatly in depth. Many consist merely of the widening of existing stream channels. In general the streams carry little sediment since the multitude of lakes act as settling basins and the crystalline rocks are difficult to erode. As a result their cutting power is reduced and their channels are marked by many rapids and falls (plate 33).

Above the 1,000 foot contour, the land rises in three directions: to the northwest, the southwest and southeast forming three marginal areas of highland. Within these highlands, many of the secondary streams that drain into the central lowland have their sources including the Seal and Knife Rivers in the north, the Winnipeg River in the southeast, and the Pembina, Swan and other streams in the southwest. In the northwest, near the provincial boundary, a local drainage divide separates the headwaters of the Seal River from Lakes Brochet and Reindeer, which drain south into the Churchill River. South of latitude 54 degrees, all waters drain eventually into Lake Winnipeg and thence via the Nelson River to the sea.

The highland along the Saskatchewan border is breached by the Saskatchewan River which eroded a broad lowland in pre-glacial time. West of The Pas this lowland has an average slope of only 4 inches per mile for a distance of 80 miles with the result that the main stream of the Saskatchewan has broken down into several channels and a large area is poorly drained and subject to annual flooding. The Carrot and Pasquia Rivers drain the southern part of this lowland. At The Pas, the Saskatchewan breaks through a natural dam in the form of a large end moraine (The Pas moraine) and then loses its identity in a series of distributory channels that widen into large lakes such as Moose and Cedar forming the Saskatchewan Delta. From The Pas moraine to Grand Rapids the average slope of this delta is 2.5 inches per mile. As a result this is a vast grassy marsh which together with the portion west of The Pas in Manitoba covers approximately 2,000 square miles.[3] (Physiographic Diagram—plate 2).

In the southwestern upland, elevations above 2,000 feet are referred to as "mountains" (Physiographic Divisions, plate 3). Turtle Mountain (el. 2,500 ft.) cut by the 49th parallel, is an erosional remnant capped by rocks of Eocene Age (plate 4). Riding, Duck and Porcupine Mountains whose eastern sides form the steepest parts of the Manitoba Escarpment are separated, in turn, by broad gentle valleys, the work of much larger, pre-glacial rivers than the present misfit streams. Their western sides slope more gradually to the upper valley of the Assiniboine River in the province of Saskatchewan.

In the southeast the area of highland rises above 1,000 feet as the rough topography of the Shield is encountered. Lake of the Woods constitutes an immense storage basin (1,500 square miles) for the headwaters of the Winnipeg River, chief source of Manitoba's developed power and of Winnipeg's domestic water supply. Further to the southeast, sandy morainic deposits impart variable relief and large areas are in peat bog and swamp.

[1]Relief is the degree of irregularity or roughness of the earth's surface and may be expressed in feet as the difference between the high and low points of a locality. Manitoba's relief is the product of many agents including water, ice, bed-rock, elevation and time.

[2]Local relief is used to measure the relief within an area of approximately 100 square miles.

[3]Much of this marsh east of The Pas moraine will be inundated when the projected dam at Grand Rapids is completed.

CENTRAL CANADA DRAINAGE SYSTEM

MANITOBA
RELIEF and DRAINAGE

ALTITUDES IN FEET

- 0 to 500
- 500 to 1000
- 1000 to 1500
- 1500 to 2000
- over 2000

▲ *Spot Heights (e.g. Mt. Baldy 2727)*

Contour Interval 500 Feet

Swamp or Marsh

WATER DEPTHS IN FEET
for Lakes Winnipeg, Winnipegosis, Manitoba and Hudson Bay

- 0 to 25
- 25 to 50
- 50 to 100
- 100 to 200
- 200 to 400
- over 400

Scale in Miles: 40 20 0 40 80 120

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

PHYSIOGRAPHIC DIAGRAM

The map of Relief and Drainage (plate 1) sets forth the major divisions of the Province into highland and lowland. The Physiographic Diagram (plate 2) attempts to show the distribution of the principal landforms by suggesting their form and shape using pictorial symbols. This map should be studied along with the Physiographic Divisions map (plate 3) and the Surface Deposits map (plate 5). For definitions of glacial terminology see glossary, page 81.

The physiographic (landform) features are the product of tectonic and gradational forces acting since the earliest geologic era, the Precambrian, over 2 billion years ago (see text page 8). Within the Precambrian Shield, mountains were several times thrust up from the sea, folded, faulted and intruded by granitic rocks. Subsequent erosion reduced these ancient mountains to features of gentle relief exposing their roots as severely altered sedimentary and volcanic rocks. This surface, sometimes referred to as a peneplain, is the kind we observe today over three-fifths of Manitoba.

Overlapping the Shield on the northeast and southwest are sedimentary rocks of Palaeozoic and Mesozoic ages, for the most part flat-lying or gently dipping (plate 4). These stratified rocks account for the general flatness of the terrain comprising the plains, except where major streams have cut into their relatively soft surfaces, or glacial deposits have taken the form of hills.

South and west of the Shield lie two major physiographic divisions separated by an escarpment: the Manitoba Lowland or First Prairie Level and the Second Prairie Level, of which Manitoba's southwestern corner is a part.

The Manitoba Lowland is underlain by gently dipping strata of Palaeozoic rocks, while above the escarpment younger Mesozoic rocks form the surface of the Second Prairie Level (Geology, plate 4). Prior to the Pleistocene or Ice Age the older Palaeozoic rocks were exposed by erosion of the overlying Mesozoic strata.

A much larger predecessor of the Red River, fed by numerous tributaries as far south as the present Nebraska boundary, flowed north through the Manitoba Lowland and the Nelson depression into Hudson Bay, eroding a broad rock trough with the escarpment as its western boundary. As successive ice sheets moved southward through the depression, they sheared and steepened the escarpment and further eroded the soft limestones of the lowland. In this way the first and second levels of southern Manitoba were formed.

Minor relief features such as moraines, eskers and beach ridges were the work of the last continental glacier and resulting glacial lakes (plate 5). Great lobes of ice advancing southward through the lowland and across the upland carried rock particles of all sizes, depositing them as undulating to rolling plains of glacial drift or till and, where they paused in retreat, as ridges of end moraine. Streams running beneath the ice deposited gravel ridges called eskers. Occasionally streams such as the Pembina followed the margins of the ice-sheet, cutting deep channels called spillways. Other streams of lesser size issuing directly from the ice edge deposited sands and gravels forming outwash deposits. As the ice gradually retreated glacial lakes were formed wherever the land sloped toward the ice-edge. In this way glacial Lake Agassiz, named after a pioneer geologist, was formed in the Manitoba Lowland and Upper Nelson plain covering at its greatest extent 110,000 square miles, an area larger than the present size of the Great Lakes combined. Along the edges of the lake, beaches were formed marking various stages and levels of the lake. Entering Lake Agassiz on the west were predecessors of the Assiniboine, Pembina, Valley, Swan, Deer and other rivers.

These streams, particularly the Assiniboine, carried immense loads of sediment varying from fine silts to coarse sands and gravels. Where they entered Lake Agassiz, deltas were built, the most extensive being the Assiniboine delta which commences a few miles west of Portage la Prairie and extends nearly to Brandon. At the close of the Ice Age westerly winds lifted the sands of these deltas forming dunes, or low hills, covering large tracts of the upper Assiniboine Delta and the bed of glacial Lake Souris.

When the ice finally retreated and the glacial lakes were drained to their present proportions, minor depressions became small lakes, sloughs and marshes. As vegetation slowly replaced open water in the shallow depressions, bog and muskeg were formed. In areas of end moraine the terrain is hummocky with depressions (kettles) and low hills (knobs) having a relief of 100 to 250 feet. These are in contrast to till plains where the typical relief is gently rolling (25 to 50 feet). Streams now occupying former glacial channels such as the Assiniboine and Pembina display old-age characteristics with cut-off meanders, ox-bow lakes, levees and back-marshes. The uplands have not developed a complete network of drainage channels and many till plains are without exterior drainage. These areas are marked by numerous ponds in swales, commonly called sloughs, which are filled to the brim in spring with snow-melt, and are partly or entirely dry by autumn. Some show accumulations of salts around their margins.

With minor exceptions, the surface features of Manitoba may be classified as a series of plains of varying origin and relief. If classified according to gradational forces responsible for their origin (ice, water and wind) we may identify ice-scoured plains, drift or till plains, lacustrine and sand plains. On the other hand, if classified according to relief differences we may group them into flat (under 10 feet), undulating (10 to 25 feet), undulating to rolling (25 to 50 feet), and rolling to hilly (50 to 300 feet). Areas of maximum relief, as much as 1,000 feet in five miles, occur along the Manitoba Escarpment. Nowhere, however, do we find any feature qualifying as a mountain, although to the first settlers the sudden change in elevation along the escarpment seemed to justify the term.

Lacustrine Plains

Flat to gently undulating lacustrine (lake) plains of considerable extent are found in the Red River Plain, the Souris Plain, Swan River Valley, portions of the Assiniboine Delta and the Saskatchewan Delta. Their origin in part is due to a glacial lake. Their low local relief (under 25 feet) is the result of sediments, fine to coarse, deposited over glacial drift during long intervals of time when lake water covered those areas.

The Red River Plain is almost level, much of it having a relief of under 8 feet. Originally large areas were swampy and impeded settlement until sluggish streams were straightened and drains built to convey spring run-off more rapidly to the Red River. This river follows the axis of the plain from the United States boundary to the Netley Marshes of Lake Winnipeg, a direct distance of 96 miles. In this distance it has an average fall of only 4.5 inches per mile. The unusual depth and general smoothness of the clay deposits forming the surface of the plain resulted from great amounts of alluvium being emptied into Lake Agassiz by the former Assiniboine River system, which at one time drained the entire southern Prairie region. As a result the present channel of the Red is closer to the eastern margin of the plain.

Of comparable relief, although of independent origin, is the basin of glacial Lake Souris which was drained in glacial times by the Pembina River, a large stream responsible for eroding a deep, broad valley through the upland of southern Manitoba. The Brandon Plain, though much smaller in area, is also of lacustrine origin. The gently undulating surface of parts of the Assiniboine Delta, especially the lower delta, is due to the less even deposition of sediments at the mouth of the Assiniboine when it debouched into Lake Agassiz. The edge of the Upper Assiniboine Delta in line with the escarpment is much dissected by short, swift streams giving this area a local relief of 50 to 150 feet.

Sand Plains and Dunes

As the flow of the main glacial streams began to abate, coarse to medium-textured sediments were laid down on flood plains and deltas, especially in the glacial valleys of the Assiniboine and Souris Rivers. Another, though more restricted source, was melt-waters carrying outwash material from the edges of the ice sheet, such as occurred near the confluence of the Qu'Appelle and Assiniboine, at the southern edge of Tiger Hills, and in the Sandilands of southeast Manitoba.

It is generally believed that at the close of the Ice Age, the climate was much drier than at present, and that strong westerly winds acting on the sandy deposits of deltas, flood plains, and outwash plains formed extensive areas of dunes. These vary in size from a few feet to over 100 feet. Their frequency has produced a sand-hill topography over large sections of the Upper Assiniboine Delta and to a lesser extent on the lower delta and Lake Souris Basin, and in the Sandilands section of the southeast where coarse-textured deposits remained after the ice and lakes receded (plate 5). Present-day dunes are fixed mostly by vegetation, principally spruce and jack pine, while a few are barren. Where areas of sandy deposits have not been disturbed by wind their surfaces are gently undulating with low relief (25 feet) and, in the Lower Assiniboine Delta, from 5 to 10 feet.

Till Plains of Low Relief

In southern Manitoba till plains of low relief (gently undulating) are mainly confined to the Interlake and Westlake districts referred to as the "limestone till plain" (Physiographic Divisions, plate3). Along with the rest of the Manitoba Lowland, this area was covered by Lake Agassiz, although it would appear for a shorter period of time, because much of its till surface is not covered by lacustrine clays. Nevertheless, the local relief is under 25 feet over large portions. Its relative flatness is due basically to the nearly horizontal beds of Palaeozoic limestone underlying the till. Large areas have micro-relief of a kind consisting of low swells or ridges, elongated in a northwest-southeast direction. These are separated by swales or hollows now largely filled with bog and swamp. Also of subdued relief are the less extensive areas of silt and lacustrine clays deposited over the till (plate 5). These are found along the west shore of Lake Winnipeg and again in linear bands west of Lakes Manitoba and Winnipegosis. Areas of somewhat greater relief (25 to 50 feet) are found at the base of the escarpment where fans of alluvium deposited by short, swift streams from the escarpment have been subsequently dissected. An added relief feature is the Lake Agassiz beaches following the trend of the escarpment and forming a pattern of parallel ridges at right angles to the direction of stream flow, thus forming bogs and swamps.

The most conspicuous relief element lies along the northern edge of the lowland in the form of an inter-lobate moraine (The Pas moraine) which may be traced along the western sides of Cormorant and Atikameg Lakes south to The Pas and thence eastward in a broad arc to terminate at Long Point in Lake Winnipeg (Detailed Relief and Drainage, plate 3). It serves effectively to block off the drainage of the Saskatchewan River, diverting its flow into the northern end of Lake Winnipeg.

In southeast Manitoba, rising gently above the 850 foot level to an elevation of 1,200 feet is an area of undulating relief. Above 1,200 feet the surface is roughened by moraines. Below this, topography is marked by beach ridges and wave-cut terraces marking varying levels of Lake Agassiz. While calcareous till predominates, it has been reworked by water. Many areas are covered by sand derived from outwash, while others are extensive tracts of swamp and peat bog.

Physiographically, the Hudson Bay Lowland is a till plain of low relief. South of the Churchill River, limestone till covers the Palaeozoic strata, while to the north the bedrock is Precambrian. Moreover, the entire region has been to a considerable extent overlain with marine clays which have further subdued the relief to an undulating plain. Strandlines, marking former levels of the sea as the land slowly rose after the retreat of the ice, constitute the major elements of relief over large areas. Their orientation at right angles to the slope, together with the impervious layer of permafrost beneath, serve to imepde drainage over most of the area as indicated by vast expanses of swamp and muskeg. The principal rivers crossing the area have entrenched themselves 50 to 150 feet into till and bedrock. Valley terraces are additional elements of relief.

Till Plains of Moderate Relief

Intermediate between the rough, morainic "mountains" and the lacustrine lowlands are the undulating to rolling till plains of moderate relief. As the ice moved over the surface, it mantled the shale bedrock more or less evenly with glacial drift. North of the Assiniboine valley these plains extend from Russell to Minnedosa, while south of the Assiniboine they extend to the Souris plain (Minnedosa-Reston Till Plain, plate 3). A second area of great extent surrounds Turtle Mountain (Boissevain Till Plain). In general the relief varies from 25 to 50 feet increasing to as much as 100 feet as the morainic uplands of Turtle and Riding Mountains are reached. The undulating character of the plain is due to the fairly even deposits of ground moraine. Those till plains lying north of the Assiniboine are pock-marked by numerous undrained swales collecting surface run-off and are commonly referred to as sloughs or "potholes". They are frequently rimmed by scattered stands of aspen presenting a pleasing landscape. South of the Souris plain the ground moraine is more uniformly distributed with fewer sloughs.

The upper portions of Valley River plain (west of Dauphin) and Swan River plain are drift-covered with recent alluvium veneering the till along stream valleys.

Till Plains of Great Relief

As the ice-front paused in retreat, or advanced slightly, deposition of till along its margin resulted in narrow ranges of hills, producing a rolling to hilly landscape. Such surfaces are pitted with depressions, many containing lakes, separated by knobby hills of stony or bouldery till. Relief varies from 100 to 250 feet. Typical surfaces of end moraine are found on Turtle, Riding, Duck and Porcupine Mountains, and form the Tiger, Brandon and Arrow Hills near the Assiniboine River.

Ice-scoured Plains

Although the Canadian Shield comprises three-fifths of the area of Manitoba, it is insufficiently mapped in detail to describe its relief except in general terms. The entire surface has been severely ice-scoured to a peneplain. Stony drift has been swept into depressions, filling former valleys and deranging drainage leaving a surface of rock-knob, lake, swamp and muskeg.

Three topographic divisions, based primarily on relative relief, can be differentiated in plate three: (1) a plain of subdued relief with extensive clay deposits and rock outcrop, (2) a plain of undulating to rolling relief with clay deposits restricted to stream courses, (3) a plain of rolling to hilly relief with much stony drift and rock outcrop. The first division (Upper Nelson plain) extends northward from Lake Winnipeg for 125 miles. The second or transitional zone, surrounds the first and extends southward along the east shore of Lake Winnipeg. Large areas are in swamp and muskeg overlying bedrock. The third or Precambrian drift plain varies greatly in relief throughout its extent. It is subdued in the Nelson depression, but becomes increasingly rough to the southeast and northwest where it reaches a maximum near the Saskatchewan border of 500 feet. In detail the surface is hilly with rock outcrop, eskers and drift ridges rising a few hundred feet above valley levels.

[1]Geology and Economic Minerals of Canada (third edition), Dept. of Mines and Resources, Ottawa, 1947, page 11.

MANITOBA

PHYSIOGRAPHIC DIAGRAM

- Lacustrine plain — extremely level
- Ice-scoured upland — rolling to hilly with abundant rock outcrop
- Till plain — gently undulating
- Ice-scoured lowland — undulating to rolling with bog and rock outcrop
- Till plain — undulating to rolling
- Ice-scoured lowland — undulating with localized clay deposits and rock outcrop
- Morainic upland — hilly with numerous end moraines
- Beach ridges and Eskers
- Sand plain with dunes
- Swamp and Marsh

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

TOPOGRAPHY and STRUCTURE

The physiographic divisions of Manitoba are mapped on plate 3 and summarized in the table below. There are four major divisions which in turn have been subdivided into 20 secondary divisions. These may be considered as the principal physical regions (physiographic regions) and are frequently referred to under physiography (page 4), surface deposits (page 10) and soils (page 12).

The first two major divisions cover 70 percent of the area of Manitoba. Because the details of physiography have not been mapped in the north, a further subdivision than that shown is at present not possible. The greater number of subdivisions in the south, covering 30 percent of the province, reflects a greater knowledge of topography and surface deposits.

Divisions	Subdivisions	Relief	Surface Deposits	Dominant Soil Types
1. Hudson Bay Lowland 27,000 square miles		Flat to gently undulating, with inadequate drainage.	Marine clays on glacial drift overlying bedrock. Marine beaches and valley terraces.	Tundra and Arctic meadow soils
2. Precambrian Shield 146,000 square miles.	A. Upper Nelson Plain.	Undulating.	Extensive areas of lacustrine clay deposits, interspersed with areas of rock outcrop and bog, cover approximately 7 million acres north of Lake Winnipeg to the Nelson River.	Grey Wooded and Organic soils.
	B. Transitional Zone.	Undulating to rolling.	Discontinuous deposits of clay in localized depressions, with much peat overlying glacial drift.	Grey Wooded and Organic soils.
	C. Precambrian Drift Plain.	Rolling to hilly.	Varying amounts and thicknesses of glacial drift with abundant rock outcrop. Numerous eskers. Bogs and lakes cover 40 to 60 percent of the surface.	Grey Wooded, Brown Podzolic, Podzol and Organic soils.
3. Manitoba Lowland 57,000 square miles	A. Saskatchewan Delta.	Flat to slightly undulating. Micro-relief due to stream braiding and channel shifting. Natural levees.	Chiefly deltaic deposits of clay, silt and fine sand overlying glacial till. An arc-shaped end moraine (The Pas moraine) divides the delta into western and eastern sections.	Alluvial (Regosol), Juvenile and Organic soils.
	B. Interlake-Westlake Plain.	Micro-relief consisting of gentle swell and swale topography with N.W. to S.E. orientation.	Strongly calcareous glacial till modified by wave action.	Rendzina, Degraded Rendzina and Organic soils.
	C. Red River Plain.	Flat to very gently undulating; micro-relief in the form of elongated swell and swale.	Lacustrine clay and alluvial deposits varying from a few feet on the margins to 60 feet near the Red River. Deltaic deposits of varying age occur along the margins, especially the western margin.	Black and Meadow soils.
	D. Lower Assiniboine Delta.	Flat to undulating.	Lacustrine sandy deposits overlying clays superimposed on glacial till. Localized aeolian deposits.	Black and Meadow soils.
	E. Southeast Section.	Variable relief, chiefly undulating to rolling. Swell and swale.	Wave modified till, glacio-fluvial deposits, end moraine, lake beaches, lacustrine and aeolian deposits. Extensive areas of muck and peat.	Black, Grey-Black and Grey Wooded soils. Extensive areas of Meadow and Organic soils.
4. Western Upland 21,000 square miles.	A. Porcupine Mountain.	Rolling to hilly.	End moraine and ground moraine.	Grey Wooded and Grey-Black soils.
	B. Swan River Plain.	Undulating to flat.	Glacio-lacustrine clays, silts and sands. Recent alluvium.	Grey-Black and Black with Meadow associates.
	C. Duck Mountain.	Rolling to hilly.	End moraine and ground moraine.	Grey Wooded and Grey-Black soils.
	D. Valley River Plain.	Undulating to flat.	Glacio-lacustrine clays, silts and sand. Recent alluvium.	Black and Grey-Black soils.
	E. Riding Mountain.	Rolling to hilly.	End moraine and ground moraine.	Grey Wooded and Grey-Black soils.
	F. Minnedosa-Reston Till Plain.	Undulating to rolling with swell and swale.	Ground moraine with some end moraine (Arrow Hills), drumlins, outwash (sands and gravels), kames and eskers (Arrow Hills), kettle holes.	Black and Grey-Black soils.
	G. Upper Assiniboine Delta.	Undulating to rolling, to hilly (dune topography and dissected margin of escarpment).	Lacustrine deposits (coarse, medium and fine textured) and recent alluvium; sand dunes; outwash.	Black, and dry sandy (Regosol) soils.
	H. Lake Souris Plain.	Flat to undulating. Duned areas are rolling to hilly.	Lacustrine deposits (clays, silts and sands) and sand dunes.	Black, Meadow and dry sandy (Regosol) soils.
	I. Tiger Hills.	Rolling to hilly.	End moraine, ground moraine and glacial outwash.	Black and Grey-Black soils.
	J. Pembina Mountain.	Rolling to hilly.	End moraine and ground moraine.	Grey-Black and Grey Wooded soils.
	K. Boissevain Till Plain.	Undulating to rolling.	Ground moraine, end moraine and alluvial deposits.	Shallow Black soils.
	L. Turtle Mountain.	Rolling to hilly.	End moraine.	Grey Wooded and Grey-Black soils.

Tectonic and Gravity Anomaly Map

Gravity anomalies shown on the map reflect subsurface inequalities in density (mass) both above and below sea-level. The gravity data, referred to as Bouguer anomalies, indicate the departure of observed gravity from the theoretical values. In computing Bouguer anomalies corrections are applied to take into consideration the distance from the centre of the earth, the height above sea-level and the effect of topographic irregularities. Thus the observed gravity values are corrected or "reduced" to a datum corresponding to a regular spheroid at sea-level.

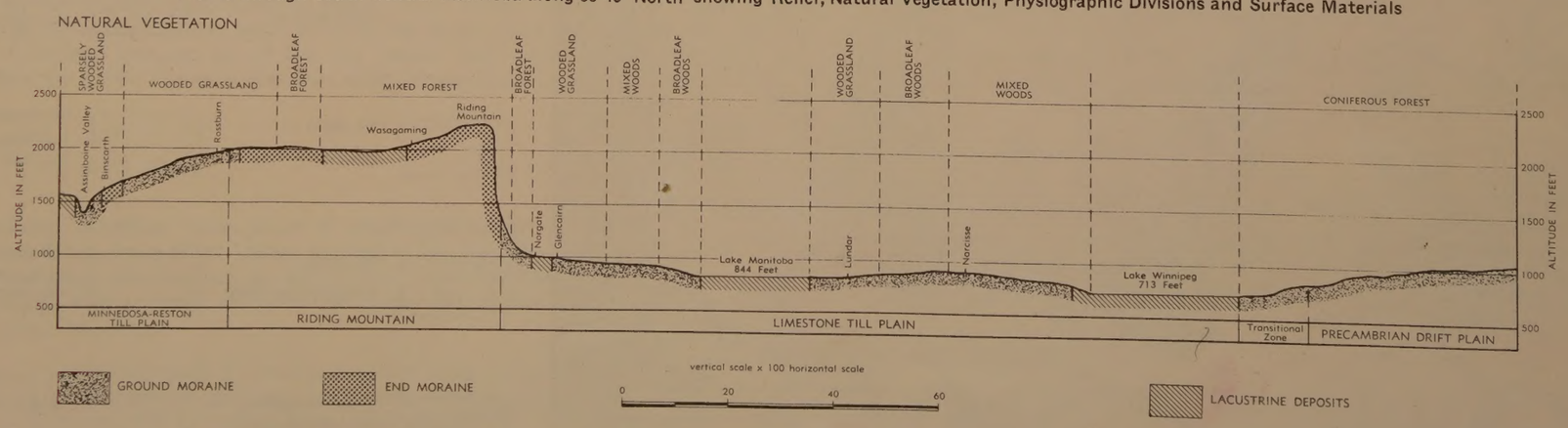
Over a relatively flat continental surface, well elevated above sea-level it is customary to find negative anomalies. Thus over most of Manitoba it will be observed that anomalies range from -200 to -500×10^{-4} c.g.s. units (gals) or -20 to -50 milligals. The extreme range is from $+400$ to -800×10^{-4} c.g.s. units.

The most interesting aspect of the gravity anomaly distribution in Manitoba is the presence of a long, broad, fairly straight zone of gravity "high" extending from north of Lake Winnipegosis towards Hudson Bay for a distance of more than 300 miles. Gravity anomaly values along this zone vary from approximately $+20$ to -200×10^{-4} c.g.s. units. This belt of gravity "high" is flanked on both sides by "low" zones in the order of -400 to -600×10^{-4} c.g.s. units. Along the northwest side of the "high" zone are a number of major faults (or breaks) in the rock structure running more or less parallel to and coincident with a series of gravity "lows". This belt of gravity disturbance is thought to indicate a tectonic belt or area of major earth structure, probably an ancient mountain system. It marks the division between the Superior and Churchill geologic provinces. In the Superior Province on the southeast, for which radioactive dating gives an age of about 2,600 million years, the structural trends generally are east. In the Churchill or Athabasca province, for which an age of about 1,700 million years has been determined, the trends are more northeasterly to northerly.

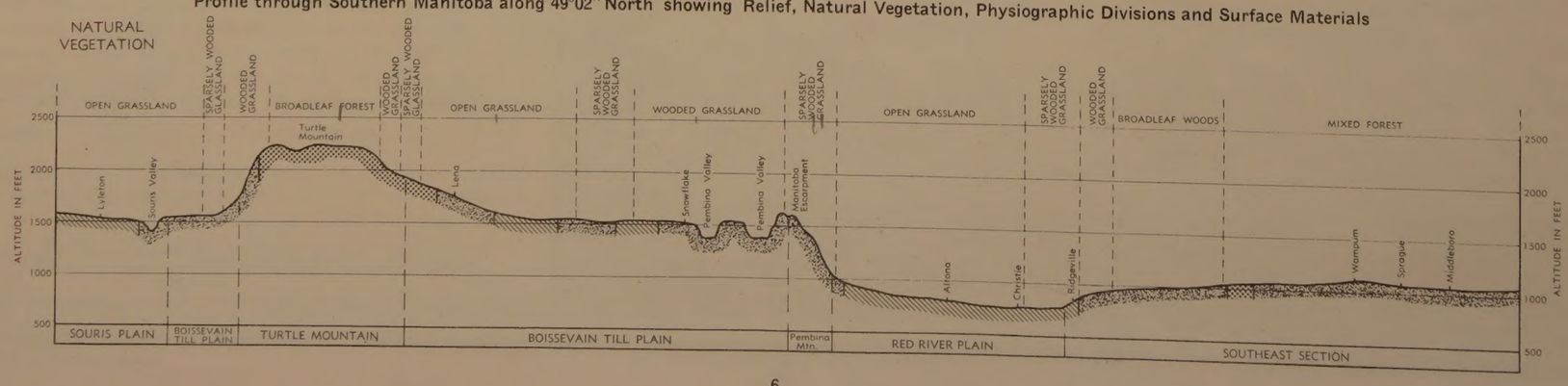
The conditions represented along the boundary between the two geologic provinces is characteristic of alpine-type mountain systems. Along such orogenic belts small intrusions of serpentinite are common. Such intrusions are numerous in Manitoba along the fault zone lying immediately northwest of the zone of gravity "high". It is possible that the gravity high itself is the result of an upward rise in the heavy ultrabasic substratum, from which serpentinite is derived.

It is along this belt of serpentinite intrusions that the large nickel deposits of the Thompson-Moak Lake area occur. Consequently this orogenic belt is of considerable economic as well as scientific interest.

Profile through South Central Manitoba along 50°40″ North showing Relief, Natural Vegetation, Physiographic Divisions and Surface Materials



Profile through Southern Manitoba along 49°02″ North showing Relief, Natural Vegetation, Physiographic Divisions and Surface Materials



PHYSIOGRAPHIC DIVISIONS

1 HUDSON BAY LOWLAND

2 PRECAMBRIAN SHIELD
- 2a Upper Nelson Plain
- 2b Transitional Zone
- 2c Precambrian Drift Plain

3 MANITOBA LOWLAND
- 3a Saskatchewan Delta
- 3b Interlake–Westlake Plain
- 3c Red River Plain
- 3d Lower Assiniboine Delta
- 3e Southeast Section

4 WESTERN UPLAND
- 4a Porcupine Mountain
- 4b Swan River Plain
- 4c Duck Mountain
- 4d Valley River Plain
- 4e Riding Mountain
- 4f Minnedosa–Reston Till Plain
- 4g Upper Assiniboine Delta
- 4h Souris Plain
- 4i Tiger Hills
- 4j Pembina Mountain
- 4k Boissevain Till Plain
- 4l Turtle Mountain

Outer Limit of Lake Agassiz

Manitoba Escarpment

40 20 0 40 80 Miles

TECTONIC and GRAVITY ANOMALY MAP

High Angle Faults

-300- Gravity Anomaly Contour

Contour interval 100 × 10⁻⁴ CGS units

Anomaly Range
- 0 to -200
- -200 to -400
- -400 to -600
- -600 to -900
- No Data

40 20 0 40 80 Miles

SOUTHERN MANITOBA

DETAILED RELIEF and DRAINAGE

750 Contour

Variation in Contour Interval

750 to 1000 interval 50 ft.
1000 to 1600 interval 100 ft.
1600 to 2600 interval 200 ft.

Altitudes in Feet
- 713 to 1000
- 1000 to 1500
- 1500 to 2000
- over 2000

Swamp or Marsh

20 0 20 40 60 Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

GEOLOGY

Manitoba, Southern Rhodesia and Madagascar share the honour of having the oldest rocks in the world with fully confirmed dates. Thus the known geological history of Manitoba is very long and complex. Radioactive dating of rocks is continually improving so that we now believe that the dates are reasonably accurate. All dates are expressed as B.P. meaning "Before the Present", an abbreviation now in common use.

PRECAMBRIAN ERA (5,000-550 million years B.P.)

The Canadian Precambrian Shield forms a great arc stretching from Quebec to the Northwest Territories and includes about three-fifths of the area of Manitoba, principally in the eastern and northern parts. Much of the Precambrian rock is concealed by soil, forest cover or glacial clay, but in general the rock exposures are good enough to work out much of the long history.

The Canadian Precambrian Shield is divided into several blocks which have different structures, different rock types and different ages of formation. The oldest block is in the central part of the shield with successively younger blocks arranged around it. It therefore seems probable that the North American continent grew in segments outward from this old continental nucleus.

The oldest block has been called the Superior Block. The western and northwestern sides of this ancient land mass run through Manitoba, with the block extending eastward to the Ontario-Quebec border. The northern and southern edges of the block are not yet known because the old Precambrian rocks are either covered by later rock formations or have not been well enough explored to delineate the edge of the block.

The Superior Block in Manitoba consists of the Precambrian rocks that lie to the south and east of the Hudson Bay railroad, that is, approximately a line between Gillam and Wabowden. The railroad runs parallel and very close to this old continental boundary. The location of the railroad is determined by this old continental boundary which controls the direction of the rivers and lakes, and makes a relatively easy route for the railroad across the Precambrian Shield which ordinarily is most difficult terrain.

The oldest rocks in the Superior Block, and thus the oldest known rocks on earth, consist of great thicknesses of lavas. The structure of these lavas shows us that the flows were erupted under water, where they solidified as submarine lava flows along with interbedded ash deposits from ancient volcanic explosions. Flow was piled upon flow so that in many places the lava formations may be several miles thick. In this manner they differ from any continental flows of the last billion years. The only place we may find similar lavas of such great thickness is beneath the present ocean basin. It seems probable that these ancient Manitoba lavas represent the original crustal material of the earth because we find similar lavas as the oldest rocks everywhere in the Superior Block of the Precambrian Shield, and these are similar to rocks that lie everywhere beneath the oceans where there has been little erosion since the earth formed. Following this early period of intense volcanic activity, thick beds of sand and mud were deposited on top of the lava flows. These sands and muds, like the lavas, are many thousands of feet thick. A similar characteristic type of mud and sand known as greywacke was deposited everywhere in this huge Superior Block of the Shield. This particular type of material is one that is deposited very quickly in rapidly subsiding basins. After the deposition of these thick sand and mud formations the whole Superior Block evidently became unstable, possibly because of the great accumulation of material. Much of the lavas, sands and muds became so deeply buried that they began to heat up due to the earth's internal temperature and the heat caused by the decay of radioactive elements. Eventually some of the rocks melted and the resulting pressures squeezed the bedded rocks of the whole Superior Block into a great series of folds with all their ridges lying in an east-west direction. The molten material, driven by its own internal pressure, was thrust upwards through the other rocks pushing them aside and baking the muds and sands so that they were changed to banded granitic rocks which we call granite gneiss.

When the molten portions finally cooled, radioactive metals such as uranium were concentrated in the last liquid portion just before final solidification. It is these radioactive metals with their break-down products which we use to date the rocks. The dates show that this activity ended everywhere in the Superior Block about 2,400 million years ago when the crust settled down. It has remained stable ever since.

The oldest rocks that have been dated are in southeastern Manitoba where the rocks finally solidified 2,700 million years ago. The locality where this date has been obtained is known as the Huron Mining Claim, located one mile south of the Winnipeg river and 12 miles west of the Ontario boundary.

When this long period of folding and melting of the earlier lavas, sands and muds ended nearly 2½ billion years ago after being intermittently active for 3 or 4 hundred million years, a great series of mountain ranges must have existed. These mountains were completely worn away more than a billion years ago, but the folding and melting left its mark on the rocks. When we look at the geological map of Manitoba, we see that in the Superior province to the southeast of Hudson Bay railway, the great belts of lavas, granite gneiss and sedimentary rocks trend east-west as they do right across Ontario in the remainder of the Superior Block. The ancient lavas only reach the present surface along scattered belts, but it is in these that most of our mines are found. Between these lava-sediment belts lie great areas of granite and gneiss which represent the molten material and the baked sands and muds.

The ore deposits in this part of Manitoba were formed during this period of activity. The steam from the molten rocks carried gold into the older lavas and sedimentary rocks and as the vapours cooled, gold and quartz were deposited in the fractures and channel-ways forming gold-quartz veins such as those of the San Antonio mine at Bissett. The final molten granitic liquids that congealed to form the radioactive pegmatites concentrated not only the rare radioactive elements but also other rare elements such as lithium, beryllium, caesium, molybdenum and tin. These pegmatites are spectacularly developed in southeastern Manitoba in the Cat Lake-Winnipeg River area. Some are now being mined for these rare elements. The molten rocks also solidified to form many granites which may be suitable for building and ornamental stone, but as yet there is little granite production except for small quarries near West Hawk Lake.

The northwestern portion of the Precambrian Shield in Manitoba to the northwest of the Hudson Bay Railway is part of what is known as the Churchill Block. This block developed in its present form about 700 million years later than the Superior Block, apparently as part of our growing continent forming around the Superior nucleus. The Churchill Block not only was formed much later but also shows fundamental differences from the geology of the Superior Block.

The great lava belts are much rarer than in the Superior Block and the sedimentary rocks contain considerable limestone as well as sand and mud. This limestone indicates a type of crust which was more stable while the sediments were being laid down. Eventually, however, the period of stability ended and these rocks too were melted and pushed and twisted into great mountain ranges during the period from 1,600 to 1,800 million years ago. The limestones, muds and sands were converted to marble and gneiss while the mountains were forming. These mountains must have been considerably different from those of the Superior Block which were arranged in great parallel rows. In the Churchill Block the present arrangement of the rocks indicates great curved, twisted and jumbled ranges. The mountain building in the Churchill Block ended 1,600 million years ago and the block has been stable ever since. As in the Superior Block, the mountains must have been eroded away more than a billion years ago, because we find rocks of the latter age lying on a flat eroded surface.

The great active period of the Churchill Block also resulted in the formation of large ore deposits. Even part of the ancient heat-resistant lava belts were melted and acted as huge natural smelters to produce the Lynn Lake copper-nickel deposits. Copper and zinc were distilled off from other lava belts and were eventually deposited in the fractures of cooler unmelted lavas to form the great ore deposits of the Flin Flon district.

Although the mountains have been worn away to a flat plain, observations of the earth's gravity field show us that the Churchill Block is not eroded so deeply as the Superior Block because the earth's crust is thicker under the Churchill portion. This is also shown by the more abundant sedimentary bands shown on the map in the Churchill Block. This shallower erosion has important economic consequences because many of the sedimentary rocks, being less deeply buried, were not heated to such high temperatures as the sediments in the Superior Block so that it was possible for copper and zinc to be deposited at the lower temperatures. Thus to the north of the Nelson River the sedimentary gneissic rocks may contain copper-zinc deposits such as those that were mined at Sherridon.

The Superior and Churchill Precambrian Blocks are separated by the root of a great mountain chain. The former existence of this great range is shown not only by the structure of the rocks, but also by observations of the earth's gravity pull along the belt. Although these mountains have been dead for 1,500 million years, the earth's gravity is still disturbed enough that we can trace the former position of the mountains which extended in a great arc from near York Factory on Hudson Bay as far as the United States border. We can do this even though the old Precambrian surface is buried in places by more than a mile of later Paleozoic rocks. The range extends from near York Factory through Thompson, Wabowden and The Pas, then into Saskatchewan curving southward so that part of it passes back into the extreme southwestern corner of Manitoba. (See plate 3B.)

This mountain range was of great economic importance to the province because the roots of the range tapped the depths below the earth's crust and allowed the nickel-bearing rocks and nickel deposits of Thompson and Moak and Mystery Lakes to come close enough to the earth's surface to be ultimately exposed by erosion.

LATE PRECAMBRIAN (1,000 million years B.P.)

A billion years ago, after the early Precambrian mountain systems were worn flat, great seas flooded the continent and deposited more sand and mud over the land. At the same time large volcanos were erupting and spreading lava flows over much of the Shield. These events are not well recorded in Manitoba but evidence that such rocks existed in the province is shown in two small areas near Lake St. Martin where small hills of the Precambrian Shield poke through the Paleozoic sedimentary rocks. Here we see preserved remnants of these late Precambrian lavas which appear almost as fresh as recent flows.

PALEOZOIC ERA (550-220 million years B.P.)

Paleozoic time, the time of ancient life, began about 550 million years ago. The rocks record only traces of very primitive life in the Precambrian before this time, but with the start of the Paleozoic, abundant animal fossils appear. By this time the Precambrian Shield had become almost completely stable and was only occasionally subject to gentle warping of the earth's crust, so that it was periodically flooded by shallow inland seas similar to the present Hudson Bay. In general the climate was uniformly warm since many of the Manitoba seas contained coral reefs. The formations contained very little sand and no gravel so that the land surface must have been very flat. We now find this conclusion confirmed by our information from drillholes made in the search for oil. We also know that the land emerged from each of the major floodings because the top of each rock system shows the typical surface weathering. From Paleozoic time onwards most of the land gradually tilted to the westward so that the older formations are exposed along Lake Winnipeg in the Red River valley, with the later formations gradually appearing to the westward. In the smaller area around Hudson Bay, Paleozoic rocks dip eastward towards the bay.

ORDOVICIAN PERIOD (490-430 million years B.P.)

The first extensive Paleozoic submergence in Manitoba took place during the Ordovician period. The southwestern portion of the Province and the area around Hudson Bay were covered, apparently, by a western and a northern sea respectively. First sands were deposited, followed by shale and eventually by limestone, the latter making up the greater part of the series.

Much of this Ordovician limestone is coloured and mottled in a very attractive manner so that it is used as a decorative building stone. The Legislative Buildings and the Civic Auditorium in Winnipeg are excellent examples of this stone, which is quarried at Garson about 20 miles northeast of Winnipeg. Buff and pink limestone slabs from the Stony Mountain quarry are also used as decorative stones in many of the newer residential districts in Winnipeg. These limestones are also used for making sulphite pulp and crushed stone.

SILURIAN PERIOD (430-410 million years B.P.)

The Silurian seas, like those of the Ordovician, flooded both the southwestern part of the province and a smaller area near Hudson Bay. The rocks deposited in the sea were again limy types, mostly of the dolomitic variety. The rock in the quarry at Stonewall is typical and is used for lime, crushed stone and stone for chemical uses.

DEVONIAN PERIOD (410-355 million years B.P.)

The Devonian period appears to have begun in much the same way as the two earlier Paleozoic periods with the sea flooding the southwestern portion of the province. However, the land on the bordering edges of the sea seems to have become hotter and drier with desert-like conditions prevailing. At the end of the Silurian or early Devonian, evaporation increased so much in some restricted arms of the sea that gypsum was deposited forming such deposits as those worked at Gypsumville between Lake Winnipeg and Lake Manitoba.

In the more open parts of the shallow sea, coral reefs flourished and very pure limestones were deposited. These are ideal for cement manufacture and are quarried at Steeprock on the east shore of Lake Manitoba for the cement plant at Winnipeg, and near Mafeking for the cement plant at Regina, Saskatchewan. As time went on the sea became isolated in a great enclosed basin separated from the ocean. The climate gradually became even drier causing the inland seas to evaporate and become so salty that first gypsum, then salt began to be deposited on the bottom. These gypsum and salt beds occur in vast mid-Devonian deposits under the western Canadian plains. The main portion of the basin is in Saskatchewan where the salt beds are as much as 600 feet thick, but it extended from Manitoba to near McMurray in northern Alberta. Most of this salt is half mile or more beneath the present surface.

When the great sea eventually dried up completely, potash, the most soluble and rarest of the salts was finally deposited in a great belt extending across most of Saskatchewan and into Manitoba near the town of Birtle. Potash is essential to healthy plant growth and is a necessary fertilizer where crops are taken for a long time. It is not much used in Canada yet but will be a tremendous resource for keeping up our farming areas in the future. These western Canadian deposits are the largest and richest known on the earth today. It is estimated that they contain 5,000 million tons of potash (plate 29).

MISSISSIPPIAN (355-330 million years B.P.)

Mississippian rocks do not reach the surface anywhere in Manitoba, but we know that a shallow sea again flooded a relatively small area in the southwestern corner of the province because we see Mississippian rocks in core from drill holes. The area covered by these rocks is small but important since all the known oil in Manitoba occurs in Mississippian formations. Again, the rock is mainly limestone. Peculiar animals called Crinoids were abundant in this sea. These animals are related to the starfish and sea urchins but they grew in large tree-like forms in extensive gardens in the shallow seas. The animals have segmented calcareous skeletons and when they died pieces of these skeletons fell to the bottom where they accumulated in porous beds with many open spaces between the fragments. These spaces were later filled with oil and now form Manitoba's producing oilfields.

LIFE IN THE PALEOZOIC

In the Ordovician and Silurian periods the life in the Manitoba seas consisted of squid-like, snail-like, and clam-like animals, corals and sponges. Similar types occurred again in the Devonian, but elsewhere in the world, fishes and land plants first flourished in Devonian time. In Manitoba, spines of fishes are numerous in these beds. The climate was probably too dry for land plants to flourish, but if they did they have passed away without leaving any trace. Elsewhere amphibians appeared in the Mississippian but no trace has been found of them in Manitoba.

THE MESOZOIC ERA (220-70 million years B.P.)

The Paleozoic ended in a long period during which Manitoba was dry land (330-220 million years B.P.). During the late Paleozoic and the early part of the Mesozoic era the earliest formations were tilted downwards to the west and much of the rock was worn away by wind, rain and running streams.

Seas once more covered southwestern Manitoba during much of the Jurassic (180-135 million years B.P.) and Cretaceous periods (135-70 million years B.P.). The water in the Mesozoic seas instead of being clear like that of the Paleozoic, was muddy because the rocks deposited on the bottom were largely shales formed from compacted muds with only minor amounts of limestone and sandstone. The Mesozoic rocks now form the bedrock of most of the area southwest of the lakes. The eastern edge conforms roughly to the Manitoba escarpment represented by Pembina, Riding, Duck and Porcupine Mountains.

Similar conditions are apparent in Jurassic times as gypsum deposits again formed by the evaporation of marine salt water. These deposits are mined at Amaranth by a modern underground mining operation.

During the Cretaceous period volcanos were so active in the western mountains of the continent that ash beds were deposited as far eastwards as Manitoba. These ash beds are thickest in the Upper Cretaceous and are exposed in the western part of the Manitoba Lowland and the Second Prairie Level. Chemical action has changed the ash beds to white, yellowish, or pinkish bentonite beds a few inches thick and separated by beds of dark marine shale. These bentonites are mined near the town of Miami, southwest of Carman.

The Mesozoic era is known as the Age of Reptiles because it is the age when Dinosaurs wandered the earth. The only traces of these animals in Manitoba are marine varieties. The muddy seas generally were not favourable to marine life, so that marine fossils are rare.

CENOZOIC ERA

TERTIARY PERIOD (70-1 million years B.P.)

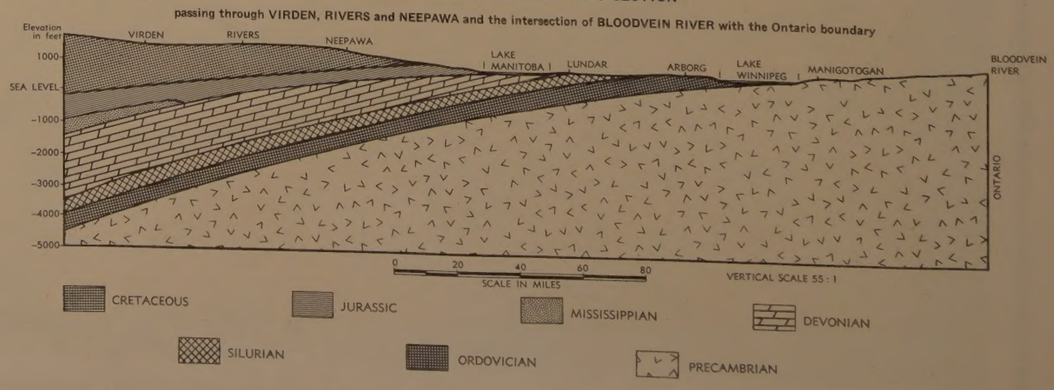
At the end of the Mesozoic era the marine waters withdrew completely from Manitoba and the rest of the plains and have never returned. However, fresh water sediments were transported into the province from the west from the rising Rocky Mountains. The only remnant of these rocks is a sandstone formation which forms the top of Turtle Mountain to the south of Boissevain.

QUATERNARY PERIOD (1 million years B.P. to present)

The Quaternary Period is commonly known as the Great Ice Age. It consisted of at least four main glacial stages when ice advanced across the whole province, retreating during each interglacial stage. For further details see page 10.

VERTICAL GEOLOGICAL CROSS SECTION

passing through VIRDEN, RIVERS and NEEPAWA and the intersection of BLOODVEIN RIVER with the Ontario boundary



GEOLOGY

TERTIARY

Turtle Mountain and Boissevain formations
clay, sand, sandstone, coal

UPPER CRETACEOUS

Riding Mountain formation
grey and green-grey shale, siliceous shale

Vermilion River, Favel and Ashville formations
dark grey and calcareous shales, limestone and bentonite

LOWER CRETACEOUS

Swan River formation
sand, sandstone, grey and red shale

JURASSIC OR EARLIER

Amaranth formation
dolomitic limestone, red shale, gypsum

DEVONIAN

Dawson Bay, Winnipegosis, and Ashern formations
limestone and dolomite

SILURIAN

Interlake Group
dolomite

ORDOVICIAN

Undivided

Stony Mountain formation
limestone and dolomite, red shale

Red River formation
limestone and dolomite

Winnipeg formation
sandstone and shale

PRECAMBRIAN

Predominantly Granite and Granitic Gneisses
granite, granodiorite, quartz diorite, and granitic gneisses

Predominantly Sedimentary Rocks
greywacke, quartzite, arkose, conglomerate, conglomerate slate

Predominantly Volcanic Rocks and Undifferentiated Basic Intrusives
andesite, basalt, derived schists and gneisses, diorite, gabbro, conglomerate, arkose

Undivided

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

SURFACE DEPOSITS and GLACIATION

The surface deposits covering the bedrock of Manitoba were, in the first instance, the product of continental glaciation and may be referred to collectively as glacial drift.[1] An understanding of the nature and extent of these deposits is important to an understanding of the soils which were developed on them, as well as to the recognition of minor landforms. This, in turn, is dependent on some knowledge of the movements of the continental ice sheet and its effects on the surfaces over which it passed.

Preglacial Surface (A glossary of terms is provided on page 81)

The major features of the Manitoba landscape, such as highland and lowland, "mountains" and valleys, were formed before the Pleistocene Epoch 600,000 years ago.[2] The rivers of north central United States, namely the Missouri and Yellowstone, instead of flowing southeast as they do today, entered Canada probably near the present Souris Valley west of Turtle Mountain and flowed through an ancestral Assiniboine Valley to join the Red River flowing into Hudson Bay.[3] At this time the upper Assiniboine River used the present Qu'Appelle Valley, which in turn received the waters of the South Saskatchewan River. This great volume of water, converging on the Assiniboine River as it flowed through Manitoba, was responsible for eroding the broad trench we observe today between Riding Mountain on the north and the Tiger-Pembina Hills on the south (plate 1). Other major rivers farther north drained the Saskatchewan prairie by way of valleys in which the Swan and Valley Rivers now have their courses. These two had sufficient erosive power to carve broad lowlands and thereby separate the Duck, Porcupine and Riding Mountains. A predecessor to the Pembina River was at work widening its flood plain between Turtle Mountain and the rock-cored Tiger Hills. Receiving these affluents was the ancestral Red River whose lowland extended from the Manitoba Escarpment to the Precambrian Shield and whose mouth may have been where the Churchill River flows into Hudson Bay.

Pleistocene Epoch

The centre of the ice covering the province was probably to the northwest of Manitoba although as a whole the ice, known as the Laurentide, stretched across north central and north eastern Canada. Striations in the rocks enable us to trace the course of its movement. It formed a huge dome many times greater than the Greenland ice cap and moved like a viscous mass until its edges extended as far south as the Missouri River. It varied in thickness with lobes following the lowlands, in particular the Red River plain. The ice plucked and carried in its undersurface stones and earth eroded from the landscape it passed over, only to deposit them many miles further on. This material known as till, or boulder clay, forms the surface deposits of most of the province today. The Canadian Shield was severely scoured. Rock and soil from its surface was carried south and west, and is found today on farmers' fields several hundred miles from its source. This is the reason that land close to the Shield is frequently very stony. As the ice eroded the soft sedimentary rocks of the Manitoba Lowland and the Southwestern Upland, glacial till high in limestone and shale was deposited and subsequently weathered into fine particles later to become our soil. Because of the diverse origin of the rock particles comprising the surface deposits, the soil is well supplied with mineral substances needed for plant growth.

The effect of ice movement on the topography was varied. Former drainage courses were filled with drift and new ones were created. Large areas were flooded by water from the melting ice, forming glacial lakes. Minor landforms such as end moraines, eskers and drumlins were produced. Within the Canadian Shield the ice plucked away weaker schists and sedimentary rocks and formed linear valleys and rock basins. Present drainage follows these irregularities. Falls and rapids occur where hard rocks have resisted erosion and these provide sites of great potential power (plate 26). Rock bound lakes such as those in the Whiteshell Forest Reserve, some with depths of 300 feet and more, provide magnificent scenery and afford the vacationist and sportsman rare opportunities to enjoy the out-of-doors. The results of ice scour served to remove the overburden from bedrock and enable the prospector to discover such rich properties as the nickel ores undergoing development at Thompson (plate 29).

The complete disorganization of drainage in the Shield is responsible for myriads of lakes, swamps and bogs. These are slowly being reclaimed by organic matter and all stages from floating bog to muskeg are encountered. For this reason land travel in the north is easier in winter when frozen ground permits mechanical equipment to operate over "winter roads" (plate 35).

In southern Manitoba the retreating ice sheet also profoundly affected drainage, but because of the nature of the underlying rocks and the topography of the preglacial surface, drainage took on an entirely different form. Great spillways such as Pembina Valley were cut into the softer, more uniform bedrock and the damming of melt waters at the edge of the retreating ice resulted in the formation of glacial lakes both large and small. As the Red River ice-lobe retreated northward through the valley, glacial Lake Agassiz, larger than the present Great Lakes combined, was formed in front of it. Its outlet during most of its existence was to the south via the Minnesota Valley and thence into the Mississippi River. Two stages are recognized in the history of the lake, separated by a low-water interval when it drained eastward into Lake Superior. Through all these variations in level, beaches were formed and sediments were deposited.

During part of this time glacial Lake Souris existed in the Souris basin in western Manitoba. For a time it received drainage from the greatly reinforced Souris River to the south and later from the Assiniboine to the northwest. This resulted in the filling of the lake bottom with sediments and explains the broad expanse of lacustrine plain found there today. The outlet for Lake Souris was the Pembina Valley which cut a steep-sided trench in the uplands. As the ice front continued to recede the Assiniboine found its present channel and the outlet for Lake Souris was diverted into it via the Souris River. As a result, the present Pembina River is but a vestige of its once great size. Tributary streams flowing into it deposited alluvium at points below Pelican, Rock and Pembina Lakes thereby damming the flow and creating lakes which today afford recreation to the people in the southwest part of the province. (See page 6).

When the course of the Assiniboine River shifted from Lake Souris to the Red River Valley, it emptied into Lake Agassiz depositing vast quantities of sand, silt and clay into the quiet waters of the lake. With the lowering of the lake level to the 1,050 foot contour the lower delta of the Assiniboine was formed (See Physiographic Divisions, plate 3). Later, as the level of the lake rose to the 1,300 foot contour, the second or upper delta of the Assiniboine River was formed. As the river entered the lake its flow suddenly decreased to the point that coarse sediments were deposited to form the sandy textured soils and dunes found in parts of this area today (plate 6).

With the recession of the ice Lake Agassiz advanced northward, its waters flooding the valleys of the Swan, Valley, Red Deer and Saskatchewan Rivers. These rivers contributed alluvium which today floors their valleys. No explanation has been given for the paucity of lake sediments over much of the Interlake and Westlake areas and north to the Shield. Of uncommon interest, however, is the formation of an extensive clay belt of some 7,000,000 acres whose area is only approximately known (plate 5). Lake Agassiz at its most northerly point reached beyond Southern Indian Lake. About 5,000 years ago an opening was found to the north into Hudson Bay which drained the lake. Today, only remnants of Agassiz which once covered 110,000 square miles[4] are seen in the form of Lakes Winnipeg, Winnipegosis, Manitoba, Dauphin and other minor lakes.

Surface Deposits

Materials resulting directly or indirectly from glaciation may be classified according to origin (lacustrine, till, outwash), or according to topographic form (drumlin, esker, end moraine, ground moraine), or according to size and character of particles (clay, silt, sand). Reference will be made to these forms as they are found generally in the province and as shown on plate 5 and defined in the glossary of terms page 81.

The beds of Lake Souris and Lake Agassiz have the most extensive lacustrine deposits, although only a relatively small part of the Lake Agassiz basin is covered by such deposits. Indeed, much of the Manitoba Lowland north of the Red River plain has a surface predominately of water-modified glacial till. Flat topography and fine-to-medium-textured materials associated with lake deposits have given rise to highly productive agricultural soils over large areas of southern Manitoba.

Clay and silt have their main distribution in the Red River plain and in smaller areas in the vicinity of Brandon, Dauphin, Swan River and west of Lake Winnipeg to Arborg (plate 5). These deposits originated from the finer fractions transported by glacial streams. Clays are mainly confined to the Red River Valley, mostly below the 850 foot contour (plate 3). Their sediments are said to average more than 100 feet over the Red River Valley and are as much as 60 feet deep under Winnipeg. In cross section they show laminations or varves. Their fine texture has impeded drainage and made necessary the draining of many parts of the valley. For the same reason, dugouts for stock watering retain water for long periods. They are moisture retentive and form the parent material of fertile Black Soil.

An extension of the Red River clays northward along the west side of Lake Winnipeg to Arborg and the Icelandic River was indeed fortuitous, for on these better materials the Icelandic settlers established their farms. Other areas of fine clays are to be found in the vicinity of Dauphin and Swan River.

Above the 850 foot contour along the margins of the Red River plain, medium-textured sediments were deposited. These have become excellent soils, well aerated and suited to the growing of vegetables and other special crops (plate 20). In the southwest is the Pembina Triangle formed by Carman, Altona and Morden. Medium-textured sediments were deposited here and also east of Portage la Prairie. A third area may be noted in the vicinity of Steinbach (plate 6). Lake clays are also found in portions of the area between Lake Manitoba and the escarpment. Other areas of clay and silt occur along the southern margin of Lake Souris, Whitewater Lake, glacial Lake Brandon and in more favored parts of the upper Assiniboine delta. In all cases such deposits have given rise to Black soils of medium to fine texture and may be correlated with highly productive farming districts of the province.

Alluvial silts, deposits of post-glacial streams, are found along major stream valleys. The largest expanse is the Saskatchewan delta east and west of The Pas. Close to the courses of the Swan, Valley and Icelandic rivers and especially along the Assiniboine Valley east of Portage la Prairie are extensive deposits of silts. These provide very fertile sites for agriculture, but usually require protection from flooding (plate 25).

Three large areas of coarse textured deposits (medium sands, fine sands and sandy loams) occur in the lower and upper Assiniboine deltas, and the Souris Valley. These are glacial-fluvial deposits of the Assiniboine River which carried an enormous load of outwash materials. As the river emptied into Lake Agassiz the coarse textured sediments were first to settle and form deltas. Of less value agriculturally, they are used largely for stock raising (plate 18). Some parts are dune-covered, such as the Spruce Woods Forest Reserve (plate 27). Small areas of medium-textured soils within the limits of the upper delta are very productive cropland. These were temporary lakes left behind after the retreat of Lake Agassiz. In the southeastern part of the province, lake deposits of a coarse texture are mingled with outwash and beach deposits. In the vicinity of Birds Hill, eskers are found which provide gravel for road building.

Associated with the varying levels of Lake Agassiz are the coarse-textured sediments found in the beaches. These are conspicuous around the margins of the Manitoba Lowland, especially along the escarpment. Topographically, they are low ridges from 10 to 400 yards wide and extending in some cases for scores of miles. Unique indeed has been their use as road beds for many of the provincial highways. In the Westlake district their orientation at right angles to the direction of slope has impeded drainage. Some have occasioned extensive marshes, such as the Big Grass Marsh northeast of Neepawa. The highest beach, the Herman, has been identified at elevations over 1,300 feet in the latitude of Winnipeg which means that 550 feet or more of lake water once stood above the site of the city.[5]

In the Upper Nelson plain north of Lake Winnipeg for a distance of 140 miles and covering an area of 15,000,000 acres is a fairly continuous deposit of lake clay surrounded by a narrower zone of localized clay deposits. Of this total only 25 per cent is estimated to be reasonably well drained, the rest being covered by water and bog.[6] The covering varies in thickness from a few inches to over 25 feet. The clay lies deeper in the valleys, but covers the low ridges producing a landscape of subdued relief. The clay is stone-free derived from streams flowing into Lake Agassiz. The agricultural possibilities of this zone are discussed on page 40.

Glacial till extends inland from Hudson Bay in a thick, unbroken sheet for at least 150 miles mantling the Palaeozoic rocks. Superimposed on this drift are deposits of marine clay laid down when the waters of the Champlain Sea extended inland to the marine limit a distance of 130 miles or more. The clays occur as small isolated areas up to elevations exceeding 350 feet above sea level.[7]

Recent alluvium forms the surface deposits along river valleys and bordering lakes.

Morainic Deposits

While large areas of the province are covered with lake and marine deposits, a still larger proportion is covered with glacial deposits laid down in direct contact with the ice. In general these fall into two types: ground moraine and end moraine.

The former was deposited directly by the ice as it retreated at a uniform rate. As a result deposits of glacial till forming ground moraine are usually undulating to rolling. Large areas of the southern part of the province, such as the Boissevain and Minnedosa till plains, are covered with ground moraine. The composition of the till varies from medium-textured, nearly stone-free materials to coarse-textured and stony deposits. Till derived from mixed shales, limestones and granites is usually high in mineral substances required for plant growth. Mixed tills comprise the ground moraine of most of our agricultural regions. However, in the central and northern parts of the Manitoba Lowland, the surface is mantled with ground moraine derived in large part from the underlying limestones and gives rise to highly calcareous soils. This till has been water-worked by waves and currents of Lake Agassiz and forms a micro-pattern of undulations trending northwest to southeast. The swales are frequently peaty so that much of the surface has organic deposits.

In the southeastern part of the province large areas are also covered by a high lime, re-worked till taking many forms and shapes, and referred to as a "lake-terrace complex." Beach deposits, end moraine and outwash all add to the complexity of the materials making up this section.

In contrast to the smooth form and more uniform composition of ground moraine, end moraine is rough with many knobs and depressions called "kettles". It is frequently in the form of elongated hills associated with the temporary stagnation of the ice margin when the rate of melting balanced the forward flow. Relief is 50 to 100 feet and conspicuous landforms such as the Brandon-Tiger-Pembina hills consist of end moraine. The surfaces of Manitoba's "mountains" are to a large extent covered with it. In the depressions within and between ridges run-off collects and many ponds and lakes form. Some, like Clear Lake in Riding Mountain National Park, are fed by natural springs. The stony composition and rough topography make agriculture inadvisable in such areas, but they are ideal for recreation, especially as they are well forested. This has been recognized in setting apart Duck, Porcupine, Riding and Turtle Mountains as forest reserves and recreational parks. A special form of end moraine known as inter-lobate is exceptionally well illustrated in the crescent-shaped Pas moraine. Frequently associated with end moraine are deposits of outwash, sands and gravels discharged by streams issuing from the ice edge. Local sandy and gravelly sites are frequently of this origin. The Sandilands Forest Reserve is situated in an area of end moraine and sandy outwash deposits. Materials of this kind, along with beach deposits, comprise many areas along the edge of the Shield from Pine Falls south to the International Boundary.

Eskers are a feature of glacial origin widely distributed over the northern reaches of the Shield. These long, twisting ridges of gravel were formed under the ice by rivers of melt-water and may be compared to abandoned railroad grades. A conspicuous esker or crevasse filling occurs in the Arrow Hills. Drumlins, less widely distributed in the province, also occur in the Arrow Hills and in the hilly sections south and southeast of Brandon. While end moraines are generally too rough for cultivation, some make splendid sources of aggregate for road construction.

[1] A glossary of terms referring to surface deposits is provided on page 81.
[2] Flint, R. F., Glacial and Pleistocene Geology, John Wiley and Sons, New York, 1957, page 301.
[3] Horberg, L. and Anderson, R. C., Bedrock Topography and Pleistocene Glaciation Lobes in Central United States, Jour. Geology, 64, 1956 p. 106.
[4] Upham, Warren, Glacial Lake Agassiz in Manitoba, Geol. Surv. Can., Annual Report, vol. 4, 1888-89, pt. E, p. 11.
[5] Ehrlich, E. A. et al, Reconnaissance Soil Survey of Winnipeg and Morris Map Sheet Areas, Manitoba Soil Survey, Report No. 5, Oct. 1953, p. 107.
[6] Ehrlich, W. A., Report on Land Inspection of Upper Nelson River Area, Manitoba Soil Survey, September, 1952, unpublished.
[7] McInnes, W., Nelson and Churchill Rivers, Geol. Surv. Canada, Mem. 30, 1913, p. 69.

SURFACE DEPOSITS

LACUSTRINE MATERIALS

- Clay and Silt
- Clay and Silt (with bog and rock outcrop)
- Sands and Sandy Loams
- Gravels –

GLACIAL DRIFT

- Predominantly Shale and Limestone (with granitic materials) –
- Predominantly Limestone
- Predominantly Limestone (with bog and sand)
- Predominantly Granitic Materials (with Precambrian rock outcrop and bog)
- Predominantly Granitic Materials (with Precambrian rock outcrop, bog, and localized clay)

MARINE DEPOSITS

- Marine and Alluvial Materials (with extensive bog)

OTHER FEATURES

- Eskers and Kames
- Lacustrine and Marine Strand Lines
- End Moraine
- Dunes
- —— —— Approximate Limit of Glacial Lake Agassiz

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

SOILS

1 Shallow Black Soils

The shallow black soils in Manitoba are transitional between the Dark Brown soils of the Saskatchewan prairie and the Black soils of the "park belt" immediately to the north. They are located in the southwest of the province and form a semi-circular fringe around Turtle Mountain, extending outward for 20 to 25 miles.

These soils are the product of a subhumid climate (plate 9), a natural vegetation of mixed tall and short prairie grasses (plate 10), and gently undulating topography with a relief of 25 to 50 feet. The parent material is light grey, calcareous till. Precipitation annually averages 16 to 17 inches, but with a fairly high evaporation rate this area suffers an annual moisture deficiency averaging 4 inches. It is an area of periodic droughts. These factors have resulted in a transitional soil reflecting in the A horizon characteristics of the more humid soils, but showing evidence of moisture deficiency in the shallowness of the soil profile. Their depth is characteristically 8 to 14 inches. The thin black A horizon, from 3 to 6 inches deep, is well supplied with organic matter from branching root systems which impart a dark hue. The B horizon, from 4 to 7 inches, is brown in color with a prismatic or columnar structure. Below the prismatic structure the soil color changes to light brown and buff, speckled with lime carbonate reflecting dry subsoil conditions.

Associated with the zonal soils are Meadow and saline soils. The former are found in locally humid areas, such as swales, and consist of a shallow black surface horizon high in organic matter and a greyish B horizon with iron stains indicative of a high water table. The saline soils are found also in local depressions, where ground water charged with salts rises close to the surface or where the evaporation of seasonal run-off leaves white encrustations. These soils are inherently very fertile and yield excellent wheat crops provided seasonal rainfall is adequate (plate 20). Moreover, they yield wheat having the highest protein content of any grown in the province. Management problems centre around the periodic droughts. Soil drifting is a serious problem. Knolls exposed to wind have a characteristic brown color indicating removal of the A horizon. At all times emphasis is placed on conserving soil moisture. This area has the highest percent of land in fallow in the province.

2A Black—Fine-Textured Soils

Occupying the lowest parts of the Red River-Assiniboine drainage basin, and covering an area of 4,000 square miles, are the Black soils (Blackearth) of fine texture and low permeability. The dominant factors in their formation are (1) the fine texture of the parent material, (2) the lush cover of grasses that made up the natural vegetation, and (3) the exceedingly flat terrain inhibiting drainage. The finest of lacustrine clays were laid down in the lowest portions of former Lake Agassiz (approximately below the 850 foot contours), so fine that water percolates very slowly through them. The natural vegetation was predominantly a grassland, but unlike that in the southwest, was induced by excessive amounts of moisture in the soil, discouraging tree growth and giving rise to tall grass and meadow species (plate 10). At the same time the general flatness of the terrain characteristic of the Red River plain resulted in nearly two-thirds of the area being marsh and swamp before settlement. Streams from the bordering uplands produced heavy spring run-off and caused local flooding. Climatically, this region receives more annual precipitation (18 to 20 inches) and is one of greater moisture reserve than areas to the west (plate 9).

Under these conditions, imperfectly drained soils with a thick black A horizon (6 to 12 inches) and a weakly developed brownish B horizon resulted. The A horizon has a granular structure and is well supplied with organic matter. Underlying the B is a zone of lime carbonate accumulation somewhat nearer the surface than in the medium- to coarse-textured Black soils. Associated with the zonal soils, by reason of poor drainage, are Meadow soils and Peaty Meadow soils. Saline soils and alkalinized (solonetzic) soils are widely distributed. The latter result from soluble salts being carried more deeply into the profile, which may be induced by artificial drainage. This produces a poor structure in the B horizon almost impervious to water and, when plowed, forms very hard clods. Soil management problems relate to heavy tillage, poor aeration and periodic saturation by ground water. Installation of artificial drains has reduced the flooding hazard and lowered salinity in some areas. These soils are very fertile and, along with the medium-textured Black soils, are undoubtedly the best agricultural soils in Manitoba in respect to fertility and wearing properties.

2B Black—Medium-Textured Soils

Black soils of medium and coarse texture form a very irregular pattern on the soils map. Texture differences relate to the parent materials: *coarse* in the case of sandy deposits of the Souris basin and Assiniboine delta, and *medium* on the till and shallow lacustrine plains. In the case of medium-textured Black soils developed on glacial till two general areas may be defined: (1) south and west of the Pembina-Tiger Hills and (2) along the margins of the Lake Souris basin and west to the Saskatchewan boundary. Those developed on lacustrine sediments are found especially along the western edges of the Red River plain below the escarpment and south of Lake Manitoba, while a small "island" occurs east of the Red River. Natural vegetation was highly important in imparting the deep black color and high content of available organic matter (humus) to the surface horizon of the Black soils. These soils are found characteristically in a tall-grass and grass-tree landscape. Where timber replaces grassland, as in the north-facing slopes and higher parts of the Brandon-Tiger-Pembina Hills (plate 3), a transition to Grey Wooded soils follows. In the area adjacent to the Saskatchewan boundary, fringes of aspen occur around grassy swales occupied by the meadow associates. Topography varies from flat in the Red River plain to undulating on till plains to the west.

The profile of the medium-textured Black soils is deeper than that of the other members, being as much as three feet in thickness. These soils are better drained than the fine-textured Black soils yet not excessively so, as in the coarse-textured member. The A horizon is thick (10-14 inches), deep black, high in organic matter, granular in structure and friable. When dry it has a tendency to form cloddy columns. The B horizon is brownish and thicker (3-8 inches) than the other members of the Black soils. The lime carbonate layer underlies the B at a depth of 15 to 30 inches. The medium-textured black soils as a group are the most productive in the province, especially if derived from lacustrine sediments. On till plains, the topography is frequently broken by swales and the soils are stony. Grain crops, especially wheat, have been a favorite on these soils; but with the advent of special crops, parts of the Red River plain now yield preferred crops of sugar beets, corn, sunflowers and canning vegetables (plates 18 to 20). No unusual management problems are associated with these soils. The most serious hazards are wind erosion during dry periods and water erosion on sloping topography.

2C Black—Coarse-Textured Soils

For the most part the coarse-textured soils are confined to the lower parts of the Souris basin, the upper and lower Assiniboine deltas and a narrow zone parallel to the escarpment. Local stretches of gravelly and sandy soils are found along the Assiniboine Valley and on outwash deposits (plate 5). Parent materials have been both water-deposited and wind-laid, in the latter case forming dunes. Soils derived from these materials have low water-holding capacity and, unless the water-table is close to the surface, are droughty. Some deposits are 200 feet thick. The natural vegetation is one of mixed grasses with enclaves of trees occupying duned sites such as the Spruce Woods Hills. These sites have white spruce, poplar and oak. However, grass usually predominates. Topography varies from gently undulating on lacustrine plains, to hilly where dunes have formed. Ground water is frequently present at depths from 6 to 20 feet below the surface, especially in the lower Assiniboine delta and Souris basin areas. While in many respects the profile characteristics are typical of Black soils, they have poor structure and erode easily. The A horizon is usually fairly thick (6 to 15 inches) but weakly granular, while the B (2 to 4 inches) has loose structure. A lime carbonate layer is strongly developed where the water-table is periodically high. Associated soils include degrading Black, where woods invade grassland, and Meadow and Black-Meadow on locally humid depressions. Management problems centre around the control of wind erosion and depletion of organic matter with tillage, and in the case of the lower Assiniboine delta, a high water-table in wet seasons. When repeatedly cropped the poorly consolidated A horizon is a prey to wind erosion. In consequence, these soils are better suited to stock raising and mixed farming than to grain farming.

3 Black—Grey Wooded Transition

Between the typical Black soils developed under a cover of native grasses and the Grey Wooded soils developed under predominantly broadleafed forest (plate 10), lies a zone of varying width in which every gradation in the soil profile may be found. This is the zone of Grey-Black soils sometimes referred to as degrading Blackearths. These soils occupy sites where grassland vegetation was invaded by trees, mostly aspen, thereby "degrading" the typically Black profile. Such areas usually have a more humid and slightly cooler summer climate.

Because of a small accumulation of leaf matter at the surface and a more humid soil climate, a typical degraded Black soil is altered slightly by leaching. Eluviation occurs in the A horizon with the loss of some organic matter and clay to the B. The A horizon is neutral to slightly acidic and is greyish or mottled with grey patches. The B horizon is altered, to a slight extent, by illuviation resulting in a nutty rather than columnar structure, and the soil aggregates are coated with colloidal clay and humus. Moreover, the B increases in depth and is about equal to the A in thickness. Beneath it the lime carbonate layer is concretionary, and occurs at greater depths than in the Black soils.

Five extensive, but detached areas of transitional soils lie within Manitoba. The Swan River plain and the upper part of the Valley River plain (Gilbert Plains) were well wooded before settlement, although the original soils were developed under grassland. Today, these lands are mostly under crop and have very productive soils, suited particularly to coarse grains (plate 20). The Minnedosa plain (Roblin to Neepawa) slopes gradually from the Assiniboine River to the wooded upland of Riding Mountain. With northward ascent the moisture efficiency increases; grassland with some aspen-ringed swales gives way gradually to closer stands of trees, and variations from typical Black through slightly degrading Grey-Black to Grey Wooded soils occur. The highlands south of the Assiniboine delta and along the escarpment make up the Brandon-Tiger-Pembina Hills landscape. Again, by reason of elevation and exposure, a more humid climate has contributed to the formation of transitional soils. Along the northern and northeastern slopes, trees have invaded the grassland producing Grey-Black and in places, Grey Wooded soils, while on the southerly slopes warmer and drier conditions have favored a natural grassland with Black soils. The eastern margins of the Red River valley have experienced encroachment of mixed woods producing a narrow band of Grey-Black soils. This zone extends northward along the western edge of Lake Winnipeg into the neighborhood of Arborg. Less suited to grains, the eastern zone is devoted to mixed farming with emphasis on hay crops, and to dairying. Associated with Grey-Black soils are large areas of intrazonal soils, namely, Meadow, Degraded-Meadow and Peaty Meadow soils, Bog and Half Bog. Management problems associated with Grey-Black soils relate to erosion by wind and by water in areas of steeper slope, to a cool spring and a wet fall and to stoniness in some districts. Depending on the degree of degradation, transitional soils are not inferior soils. Some have a high fertility rating.

4 Grey Wooded Soils

Grey Wooded soils are characterized by leaching and illuviation in the A horizon, and accumulation of clay and organic matter in the B horizon. At the surface a leaf mat is underlain by a grey-black thin A_1 horizon, beneath which is a leached, ash-grey A_2 layer, characteristically seen on the surface of newly plowed fields on the fringe of settlement. The B horizon is brownish in color with a nutty structure, underlain by an accumulation of lime carbonate.

As these soils are usually low in available nutrients, management problems relate to additions of nitrogen and phosphorus. Stoniness and erosion often are present as these soils are formed characteristically on rolling to hilly drift deposits. Associated soils are usually Peaty Meadow and Organic soils.

Grey Wooded soils are among the least fertile of the agricultural soils of this province. However, good yields of grasses and clover are obtained and coarse grains should do well if fertilizers are used. Marginal mixed farming and stock-raising are associated with these soils.

5 Rendzina Soils

Rendzina soils are grassland soils which have developed from high lime parent material, having at least 40 per cent calcium carbonate content. These soils are found west of Lake Manitoba as far north as the Dauphin plain and to a lesser extent east of Lake Manitoba. They are coincident with areas of grass-tree association. Because the high lime content of the soil discourages tree growth, grasses are the dominant natural vegetation on the better drained sites. The topography throughout most of this zone is swell and swale, with tall prairie grasses mixed with scrub poplar and oak on the gentle ridges and wet meadow grasses in the swales. Under these conditions many associated meadow soils are found in the swales. The profile of a Rendzina soil has a black A horizon 4 to 10 inches in depth overlying directly highly calcareous parent material which has inhibited the formation of a B horizon.

Problems associated with tillage are considerable. Surface stones litter the fields. The excessive amount of free lime in the surface horizon adversely affects the availability of phosphorus. The available nitrogen is low and the micro-relief inhibits drainage. Application of phosphorus fertilizers is essential both for cropping and for pasture. Notwithstanding, these soils can produce exceptional crops of alfalfa seed. Livestock raising with dependence on natural hay is the dominant farming type. Conditions are marginal for mixed farming.

6 Degraded Rendzina Soils

Soils originally developed under grasses over high lime drift, and later altered by forest invasion are called Degraded Rendzinas. These soils are distributed mainly through the Interlake plain, west of Lake Winnipegosis and north to the contact between Palaeozoic and Precambrian rocks. They resemble Grey Wooded soils, but have a shallower profile. The presence of a leaf mat has altered the acidity of the surface horizon, producing some leaching and eluviation and forming a distinct B horizon which is lacking in the Rendzina. Beneath a leaf mat is a whitish grey leached A_2 horizon. The B is grey-black to grey-brown in color with a nutty structure. At the base of the B is a lime carbonate accumulation overlying limestone till. Management problems are similar to those of the Rendzina. When cultivated, the slightly acid A horizon becomes mixed with the B and C materials forming a neutral to alkaline soil. Productivity for grains is similar to the Rendzina and farming shows emphasis on hay crops and livestock (plate 18).

7 Alluvial Soils

Freshly deposited silts along river flood plains and on deltas are referred to as alluvial soils. They are immature soils in that time has not permitted the development of a profile. They are normally very fertile unless they contain excessive amounts of soluble salts, or are poorly drained. Being stone-free they are readily tilled. As a rule these soils occur on sites requiring draining and diking to protect them from seasonal flooding. If such precautions are taken they usually yield good crops, especially vegetable, root and hay crops. The largest areas of such soils in Manitoba are found in the Pasquia Valley and in the Saskatchewan delta where usability depends on diking and drainage.

8 Podzol Soils

These soils are developed on acid parent materials derived from coarse-grained crystalline rocks, and form under a cover of coniferous forest. Their distribution has not been differentiated, except as associated with Grey Wooded soils over large areas of the Canadian Shield. Sandy, jack-pine-covered areas are typical sites. Compared to the Grey Wooded soils they are more strongly leached, more acidic and lacking in lime carbonate. Under a mantle of coniferous forest litter, acids are formed which leach the A horizon and leave an ash-grey A_2 layer. The iron and organic matter is carried to the B which is reddish brown in color. These soils are inferior for agriculture and rarely used in Manitoba.

10 Tundra Soils

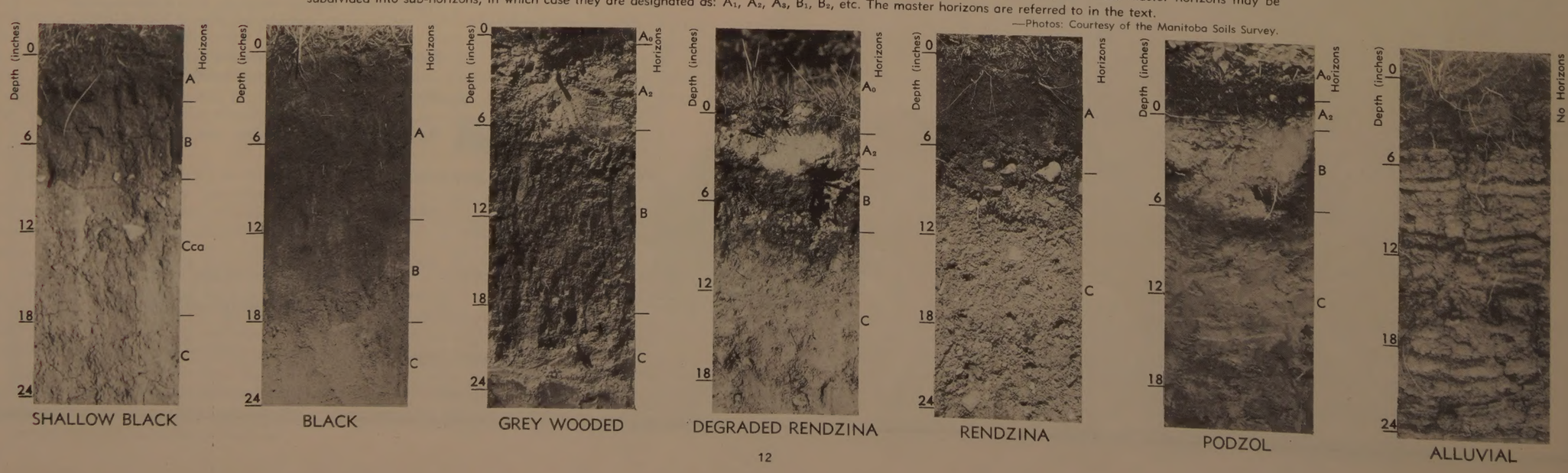
The Forest-Tundra transition (9) and Tundra Soils (10) are underlain by perma-frost. Under cool, wet ground conditions there is little profile development. These soils are located in climatic areas unsuited for agriculture.

[1]For more detailed information on the soils of Manitoba reference should be made to the reports of the Manitoba Soil Survey.

Profiles Typical of Manitoba's Zonal Soils

The soil profile, as viewed in vertical cross section, consists of the various layers to a depth of three or more feet. These layers are called soil horizons and differ from one another in one or more of the following features: color, texture, structure, consistence, reaction, concretions, intrusions, and chemical and biological composition. The main horizons are designated by the letter symbols A, B, C. For more detailed description these master horizons may be subdivided into sub-horizons, in which case they are designated as: A_1, A_2, A_3, B_1, B_2, etc. The master horizons are referred to in the text.

—Photos: Courtesy of the Manitoba Soils Survey.



SOILS

SOIL ZONES		ASSOCIATED SOILS
Grassland Soils		
1	Shallow Black	Meadow and Saline
2a	Black - fine textured	
2b	Black - medium textured	Degrading Black, Meadow, Saline and Solonetzic Soils
2c	Black - coarse textured	
Grass - Woodland Transition		
3	Black - Grey Wooded	Black, Dark Grey, Peaty Meadow
Forest Soils		
4	Grey Wooded	Dark Grey, Peaty Meadow, Half Bog and Bog
5	Rendzina (high lime)	Black, Meadow, and Saline
6	Degraded Rendzina	Grey Wooded, Dark Grey, Peaty Meadow, Half Bog
7	Immature Alluvial	Peat, Saline
8	Grey Wooded, Podzol	Rock Outcrop, Peat
Forest - Tundra Transition		
9	Podzolic - Tundra	Rock Outcrop, Peat
Tundra		
10	Tundra Soils	

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

CLIMATE and TEMPERATURE

Climate is the generalization of daily weather conditions over a period of many years. It results from the interaction of various controls such as air-masses, pressure systems and topography, producing variations in temperature, humidity, forms of precipitation and local winds. The purpose of the maps (plates 7-8-9) is to show the distribution of these basic climatic elements and in the accompanying pages of text, to advance reasons for variations.

Controls of Climate

The major controls basic to an understanding of Manitoba's weather and climate are (1) location, (2) semi-permanent atmospheric pressure cells, (3) air masses, fronts, cyclones and anticyclones, (4) elevation and relief. Daily as well as seasonal variations in temperature, precipitation, winds and other elements depend upon changes in these controls.

1. *Location*—Location has two aspects, latitudinal and relative. Manitoba is located between latitudes 49 and 60 degrees north. This is the higher middle latitudes where seasonal as well as daily temperature changes are considerable. The amount of insolation received at Winnipeg in the course of a year is 60 percent of that received at the equator. However, because of the longer day in summer, the amount of insolation reaching us in June and July at the height of our growing season is actually greater than that received at the equator for those same months. During our longest day (June 21), Winnipeg receives 16 hours, 22 minutes of daylight, Wabowden 17 hours, 25 minutes. The latter has 61 hours more daylight for the three months June, July and August than Winnipeg. However, with increasing latitude (as we go north) the intensity of the sun's rays decreases rapidly so that length of day does not entirely compensate for it.

A second aspect of location is position relative to large land masses or bodies of water. By reason of its position, a little to the north of the geographic centre of the continent, Manitoba has a "land-controlled" climate. Removed 1,500 miles from the modifying influence of the Pacific in winter, the climate is well described as *continental*, that is, one which has large seasonal temperature ranges and is moderately dry much of the year. While the northeast of the province borders on the large expanse of Hudson Bay, the latter is ice-covered for 9 months of the year and except in summer is not significant as a source of moisture. From over the Arctic seas to the north the cool air has a low water vapour content at all seasons so that little moisture originates from that source. Most of the precipitation in southern Manitoba comes either from the Pacific or from the waters of the Gulf of Mexico and Caribbean Sea. In the former case the trajectory is long and extends over mountainous areas with considerable modification (drying) of the original air. In the latter case, tropical Gulf air only occasionally covers the region at ground level although it is more frequently found above cooler air. Distance from the Atlantic is not significant in a discussion of Manitoba's climate as the prevailing atmospheric circulation is from west to east. Only on rare occasions is Atlantic air imported.

2. *Semi-Permanent Pressure Cells*—During the winter a semi-permanent "high" atmospheric pressure centre forms over the Mackenzie basin. From this centre cold air periodically spreads southeastward to blanket the Prairie Provinces and the central states of the U.S.A. Typical wind directions are from the northwest. Northern Manitoba is in its grip much of the winter, while southern Manitoba is affected intermittently from December to February. Clear, cold, mostly calm weather with much sunshine is typical of its control. Cold waves with temperatures dropping well below zero are identified as outbreaks of cold air from this centre. At the same time, it tends to block the passage of mild Pacific air as it moves eastward in the winter and diverts depressions well to the south. Over the Great Basin of the United States is located a second semi-permanent "high" with less direct effects on the climate of the central plains. This centre and the Mackenzie cell constitute the major "highs" between which depressions move in sequence from west to east across the continent. Also during the winter season the north Pacific Ocean off Alaska is a well developed semi-permanent low pressure centre, the source region of many storms which cross the mountains and pass eastward over the Prairie region.

During the summer season, the high pressure cells referred to diminish greatly in intensity. Land areas become lower in atmospheric pressure while over the Pacific and Atlantic oceans, semi-permanent high pressure cells intensify about latitude 30 degrees. From these "highs" as source regions maritime Tropical air is fed into the continent.

3. *Air Masses and Cyclones*—Four principal air masses which, by their passage over the province, exert major control of both temperature and precipitation are: (1) continental Arctic, (2) maritime Arctic, (3) maritime Polar, (4) maritime Tropical. Continental Arctic air has as its source region the snow- and ice-covered surfaces of northern Canada and the Arctic islands. Its outward flow, unobstructed by mountain barriers, is accompanied by severely cold weather in December extending into February. In the summer, the source region in high latitudes has considerable open water so that Arctic air occasionally brings some moisture to northern Manitoba.

The source of most of the moisture reaching southern Manitoba in the winter, and of the mild spells that alleviate the intense cold of mid-winter is maritime Arctic air from the north Pacific Ocean. When the Mackenzie "high" temporarily recedes, this relatively warm, moisture-laden air mass moves across the northern ranges of British Columbia carrying its ameliorating influence eastward, although it is usually subject to considerable modification by the time it reaches Manitoba. Only occasionally in winter does tropical air reach Manitoba (and always in the upper atmosphere) bringing with it heavy precipitation. Maritime Polar air also originates from the Pacific, though farther to the south, crossing the central Rockies and entering the plains as warm dry air, frequently as a chinook. Because of the great distances to be traversed, it reaches Manitoba infrequently and always as a dry, warm mass usually accompanied by westerly and southwesterly winds. During the summer, air from southwest United States (continental Tropical) sometimes spreads northeast to cover the plains in a heat-wave, accompanied by drought conditions. Southwestern Manitoba is occasionally influenced by this air, but to a much less degree than the Prairie to the west. The dominant air mass of mid-summer in southern Manitoba is maritime Arctic or maritime Polar with occasional intrusions of Gulf air originating in seas to the southeast of the continent. Gulf air (maritime Tropical) brings with it high temperatures and high humidities and is the principal source of rainfall to Manitoba during the growing season. When air from the south meets cooler, denser air from the north of Canada, the former is lifted over the latter along the Arctic front causing precipitation. Connor[1] found that when the Arctic front oscillated over southern Manitoba, ample moisture resulted; but if the front took up a position to the north, drought prevailed over the plains.

Most of the precipitation both in summer and winter is frontal in origin accompanying the passage of cyclonic storms. Contrary to popular usage, middle latitude cyclones are relatively quiet, slow moving "lows" or depressions continually crossing western Canada and the central States. They are usually accompanied by cloud and variable winds and bring marked changes in temperature. If the difference in pressure from the storm centre to the edge is great, strong winds occasionally reaching 40 m.p.h. or more may result but this is unusual. Nevertheless blizzard conditions may accompany such depressions in winter, and dust storms in summer. On rare occasions these storms may be fed by tropical Gulf air resulting in very heavy precipitation.

Cyclonic storms are usually followed in succession by "highs", bringing in winter clear, cold dry conditions, and in summer spells of cool pleasant weather. Many cyclonic storms originate on the Pacific side of the mountains, and re-form along the eastern flank. Three well defined paths may be identified from west to east. Some form in northern British Columbia and follow a path trending eastward across Manitoba. Others called "Alberta lows" developing suddenly in southern Alberta move eastward through the southern Prairie Provinces or northern States. A third, though less frequent path, is used by storms originating in Montana and moving north easterly as far as Canada. Much of the weather of southern Manitoba is affected by these storms. In summer, unstable Pacific air or tropical Gulf air is frequently drawn into the storm resulting in over-cast skies and precipitation which may last for a day or two. The passage of the cold front may be accompanied by violent thunderstorms, squalls and heavy rains of short duration. From June to August 15 to 20 such thunderstorms will occur on the average in southern Manitoba with the number diminishing to 5 along the shores of Hudson Bay. The greater the contrast between hot humid air from the south and cool Arctic air to the north, the more violent the storm.

The interposition of the Western Cordillera obstructing the eastward movement of Pacific air has two principal effects upon the climate of the Prairie region: the air becomes *drier* and, in winter, *colder* as it is forced over the mountains. On the lee side it becomes warmer and drier by descent onto the interior plains. At times, of course, Pacific air rides aloft over lower air masses and its influence is not then felt at the surface, except indirectly through a cloud cover. The significance of the mountains, therefore, is to create a "rain-shadow" effect in the form of a triangle of *steppe* climate extending along the base of the mountains in Alberta then eastward toward south-eastern Saskatchewan. On occasional dry years, this semi-arid zone extends into southwestern Manitoba. This is the zone that caused Captain John Palliser in 1857 to define an arid triangle still referred to as "Palliser's Triangle".

4. *Elevation and Relief*—Topographic features in Manitoba are not large enough to produce sharp climatic change. The province slopes southwestward from sea level at Hudson Bay to 713 feet over Lake Winnipeg. This central lowland lies from 300 to 1,000 feet below the upland to the west. An abrupt change of slope occurs along the Manitoba Escarpment where measureable climatic change occurs. The higher surfaces of the uplands (Riding, Duck and Porcupine Mountains) are 2,000 feet or more in elevation.

The phenomenon of air drainage (gravity movement) of cold air from the highlands to the lowlands occurs along this escarpment. Warm air follows the Red River Valley northward bringing temperatures favourable to growth. It follows the depressions of the major valleys in the south bringing to them an early spring and a longer growing season. The major lakes retard the advance of spring, but lengthen the period of growth in the fall. Many micro-climatic effects result from minor relief features, some of which are referred to below and on page 16.

Temperature

Three maps (plate 7) show average (mean) temperatures for June, July and January based on 52 stations covering in whole or in part the 30-year period 1921-50.[2] A selection of 13 principal stations are graphed on pages 14, 16 and 18 based on the full period of record. All stations used to compile the 12 climatic maps on plates 7-8-9 are shown on the map, page 18.

Variations in mean January temperatures during the thirty-year period (1921–50) vary commonly +2 or +3 degrees from means based on much longer periods of record. While it has not been definitely established, this may indicate that the trend in the past 30 years has been toward less severe winters. Statistical variations in mean July records is negligible.

The outstanding feature of Manitoba's climate is the large annual range of temperature for the latitude, a direct reflection of continentality. The average annual range, based on the difference between the January and July averages for 30 stations of long record in the south was 65 degrees, increasing to 75 degrees in the north (Gillam 73). Summers are warm for the latitude averaging 68 degrees for July in the south, decreasing to 54 degrees in the north (Churchill). On the other hand winters are abnormally cold for the latitude varying from a January mean of 3 degrees in the south to −22 in the north (Brochet).

An added characteristic of temperature in this province is the large departure from the statistical mean from winter to winter. Nearly two-thirds of the January mean temperatures vary from the norm by at least 5 degrees, while one-third vary 10 degrees. Based on records at Winnipeg extending over 86 years, 58 percent of the Januaries may be expected to have from −2 degrees to −16 degrees mean temperature.[3] On the other hand, mild Januaries occur during the rest of the time when averages varying from +1 to +12 degrees may be expected. The coldest on record at Winnipeg occured in January 1875 with a mean of −16.2 degrees, while the warmest was January 1944 with a mean of 13 degrees. Variations of mean July temperatures from the norm is small throughout the province.

The Seasons

Mean monthly temperatures are below 32 degrees in each of the same 5 months (November to March) in the south and for 6 months (November to April) in the north. This is the period of winter. Mean monthly temperatures are above 50 degrees from May to September in the south and from June to August in the north, marking the period of summer. Transition from winter to summer is accomplished in one month, April in the south and May in the north; whereas October in the south and September in the north mark the transition from summer to winter. Changes of season are therefore short and dynamic.

January—The abnormally cold temperatures of January are due primarily to two circumstances: the frequent incursions of continental Arctic air and the rapid heat loss by radiation from frozen ground and snow-covered surfaces. As indicated by the January isotherms (plate 7) average temperatures vary from +5 degrees (Pilot Mound 5.6) to −24 degrees (Brochet −22.4) in northern Manitoba. The upward trend of isotherms near Hudson Bay reflects a slight modifying influence of the Bay even in winter. (Compare Churchill −17 degrees and Brochet −22 degrees). Except in southern Manitoba there are too few stations to discover minor variations in isothermal trends. In southern Manitoba, the significance of the escarpment along the edges of Duck, Porcupine, Riding and Pembina Mountains is to modify temperatures at its base. Air on the "mountains" is cooled by radiation during long nights with clear skies, and drains down slope to the lowland below. Intermediate elevations are appreciably warmer. Temperatures at Morden, Graysville and especially Dauphin are two or three degrees warmer than the centre of the lowland to the east. In the case of Dauphin westerly winds funnel between the Riding and Duck Mountains becoming warmer by descent and producing a minor "chinook" effect. Dauphin is situated 100 feet above Dauphin Lake, high enough to benefit by air drainage as indicated by a January mean of +2.5 degrees.

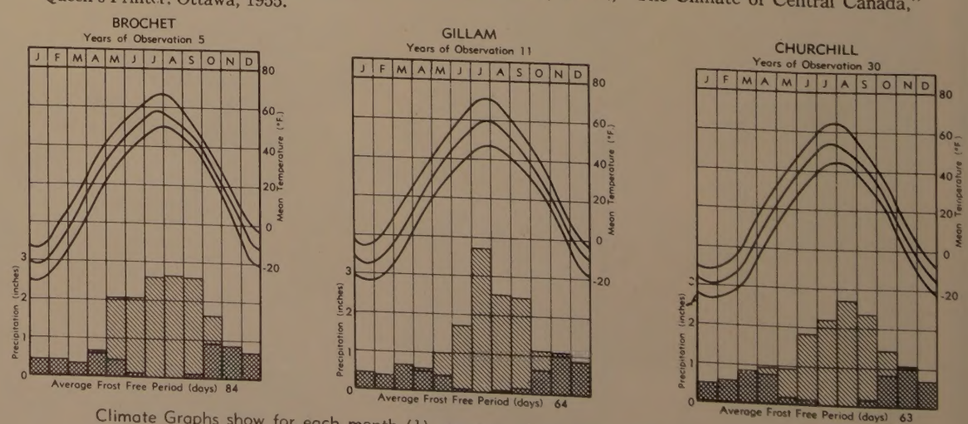
The southward "bend" of the January isotherms over the lowland indicates a cold flow of Arctic air through this depression (Gimli −2.2 degrees). The warmest part of Manitoba is in the south central area where the orographic effect of the hills affords some protection from invading Arctic air.

June and July—The three months, May, June and July, are critical to the growth of the staple crops of the region. Spring moves up the Red River Valley to the Assiniboine and thence along the Assiniboine and north along the escarpment following the low elevations. It will be observed in the isothermal maps of June and July that the lowest part of the Manitoba Lowland is Lake Winnipeg where heating is retarded by the cool waters of the Lake. A curious anomaly occurs east of the Lake. By July the whole of southern Manitoba has a mean temperature above 66 degrees with the Red River Valley the centre of maximum heating (Morden and Morris 69 degrees). From the curves of the mean maximum temperatures of the summer months (see graphs), it will be observed that for two or more months the temperature reaches or exceeds 77 degrees throughout most of southern Manitoba, thereby creating conditions highly favourable for rapid growth of agricultural crops. In the area of the south bounded approximately by the July isotherm of 68 degrees an average of 20 tropical days may be expected during which the mean maximum temperature exceeds 86. The highest temperatures on record range from 110 degrees in the south to 90 degrees in the far north. Deviations from the normal mean temperatures in the summer months are small compared to the winter months. As a rule, mean July temperatures vary between 64 and 70 degrees.

In northern Manitoba summer temperatures show a marked decrease in the direction of Hudson Bay. This trend to the southeast reflects the negative influence of the cold waters of the Bay even in mid-summer when Churchill experiences a mean maximum of 54 degrees.

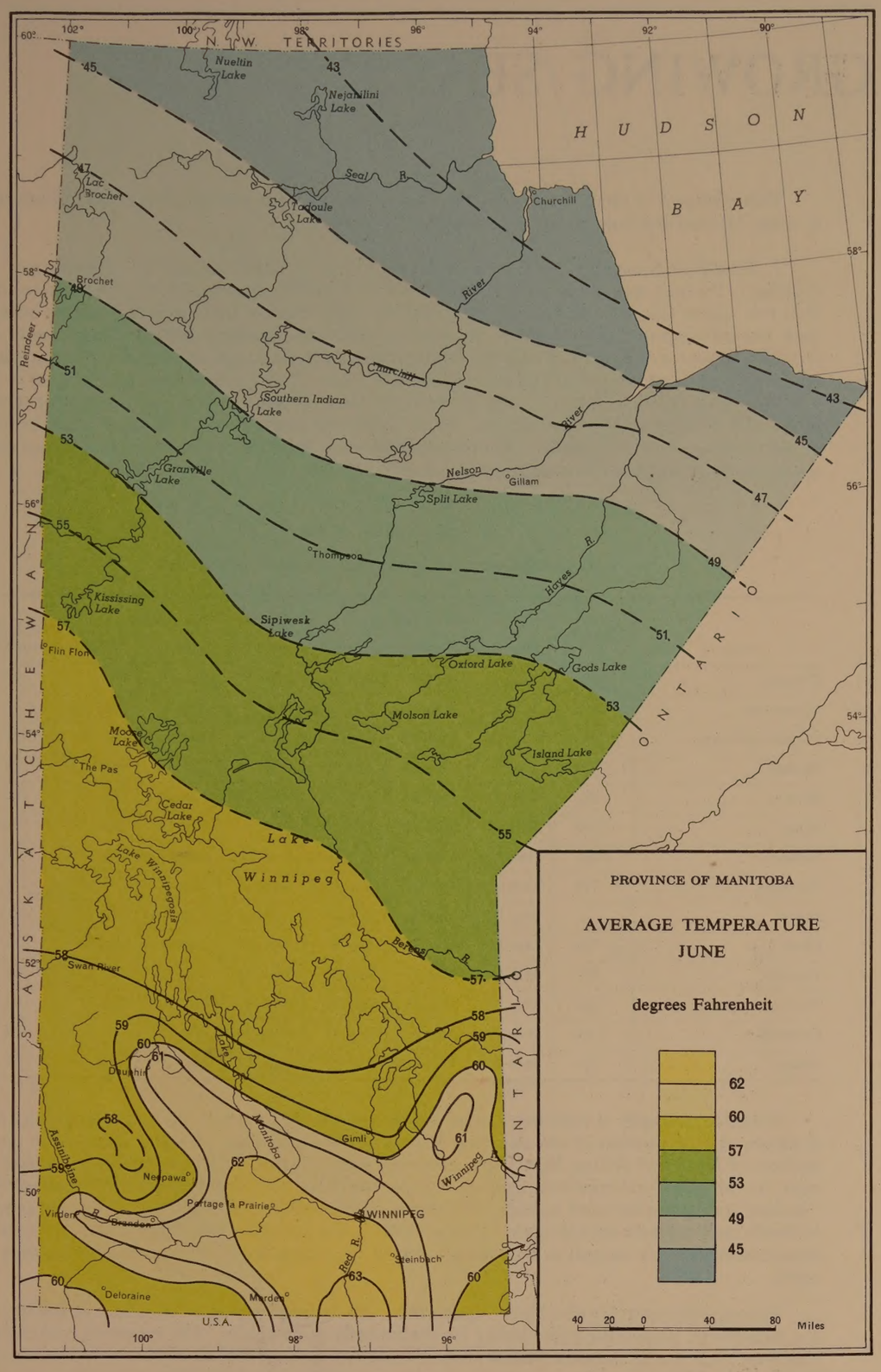
The freezing process in the Bay normally begins towards the end of October and is almost complete by late December. Frequently a shore lead develops which persists through the winter giving rise to fog (sea smoke) which occasionally drifts inland. The break-up commences in May and by late July most of the ice has disappeared. The period of navigation is from mid-August to mid-October.

[1]Connor, A. J., "The Climate of Manitoba", Dom. Met. Service, Dept. Transport, Toronto, 1939. P. 30-31.
[2]Data supplied by Meteorological Division, Dept. of Transport, Toronto. A thirty-year period was selected rather than the longest period of record in order to provide a more uniform basis of comparison. Since years of observation varied considerably between stations, greater credence was given to those stations having the longer records. See also under CLIMATE page 80.
[3]Connor, A. J., Op. cit. See also Kendrew, W. G. and Currie, B. W., "The Climate of Central Canada," Queen's Printer, Ottawa, 1955.


BROCHET
Years of Observation 5
GILLAM
Years of Observation 11
CHURCHILL
Years of Observation 30
J F M A M J J A S O N D
Precipitation (inches)
Mean Temperature (°F)
Average Frost Free Period (days) 84
Average Frost Free Period (days) 64
Average Frost Free Period (days) 63

Climate Graphs show for each month (1) averages of the mean daily maximum temperatures, the mean, and the mean daily minimum temperatures (degrees F.), (2) average total precipitation including snowfall (equivalent) and rain, (3) average frost free period in days, for 13 representative stations.

See additional graphs on pages 16 and 18.



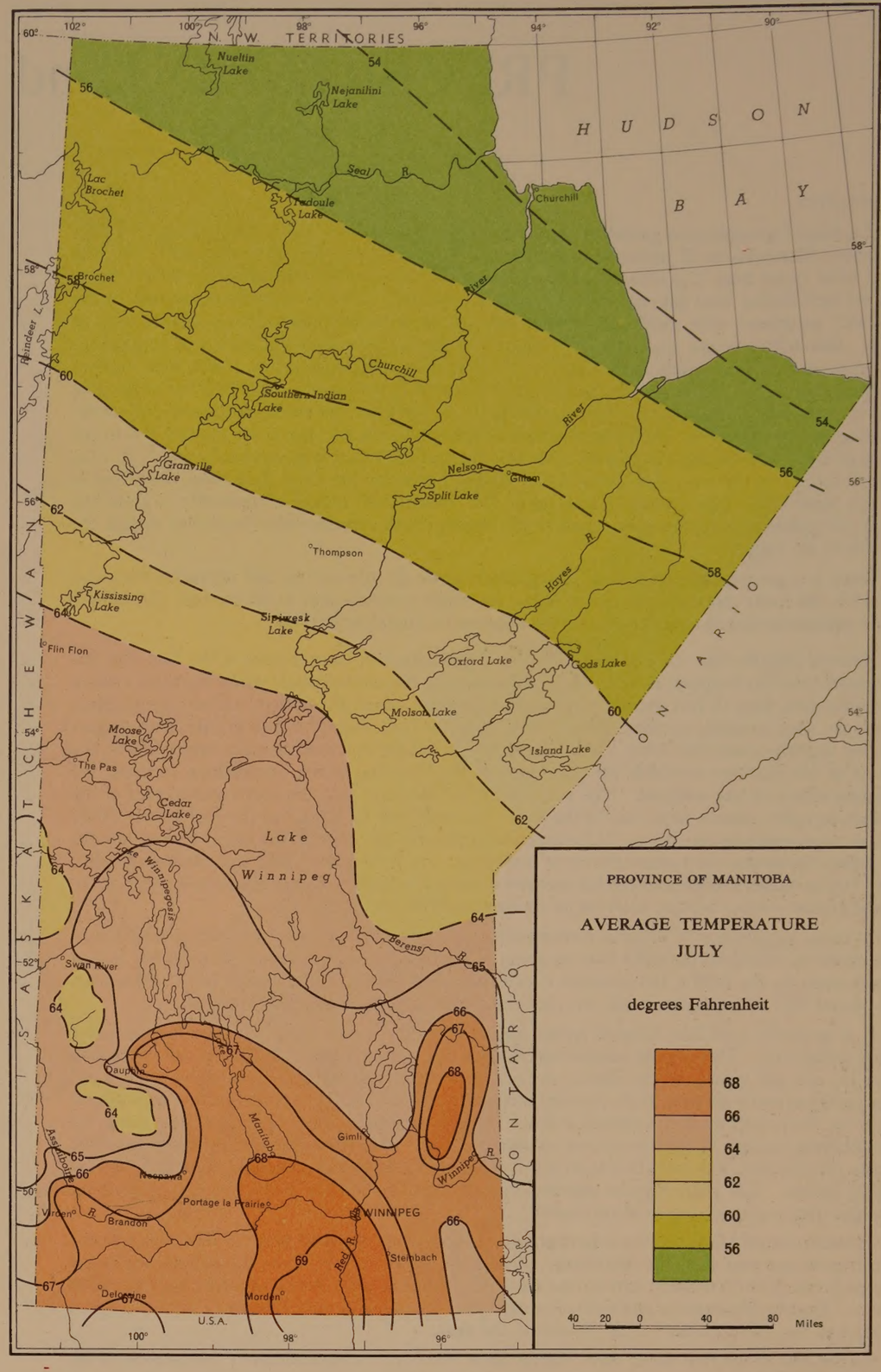
PROVINCE OF MANITOBA

AVERAGE TEMPERATURE
JUNE

degrees Fahrenheit

62
60
57
53
49
45

40 20 0 40 80 Miles



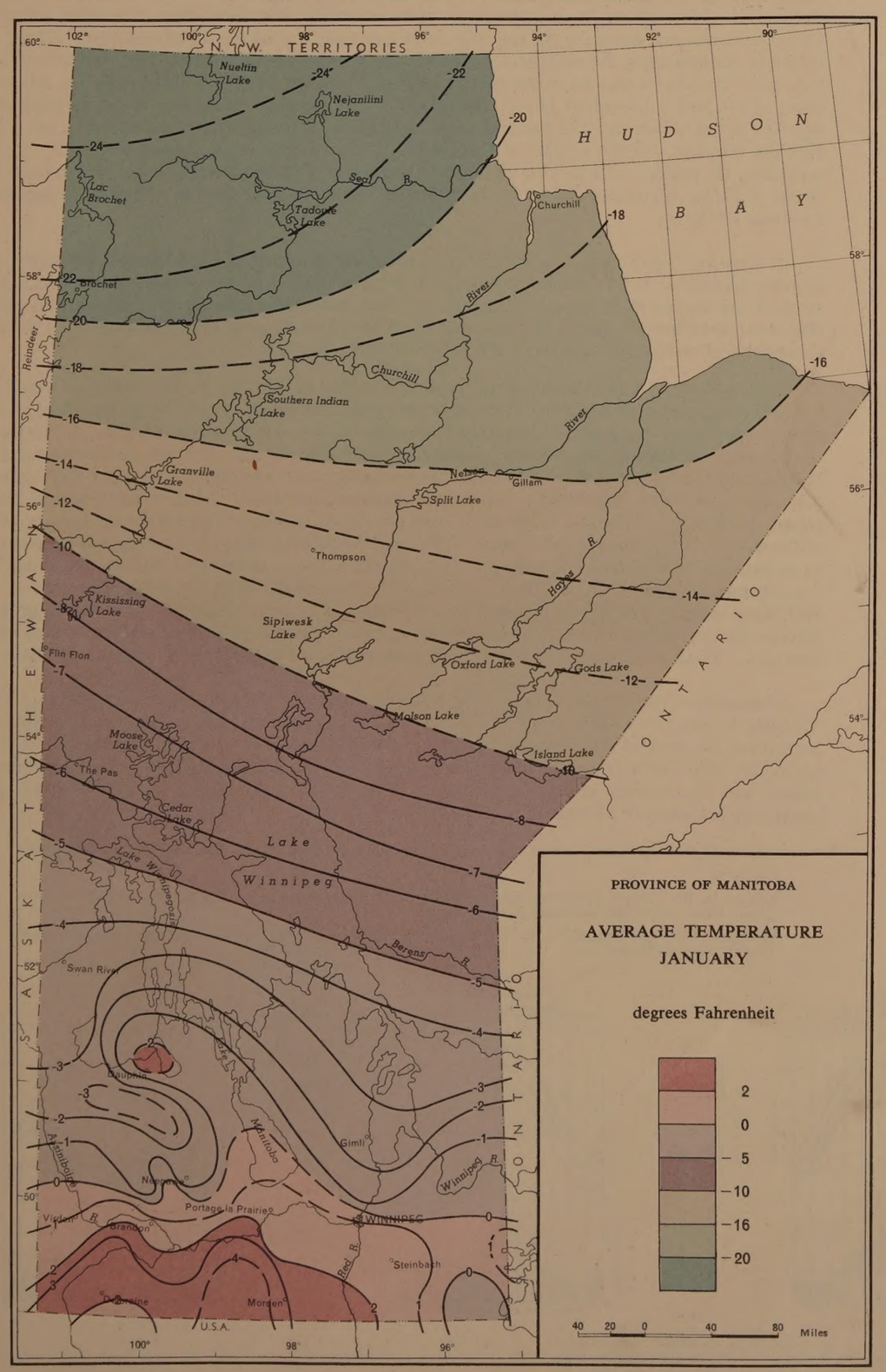
PROVINCE OF MANITOBA

AVERAGE TEMPERATURE
JULY

degrees Fahrenheit

68
66
64
62
60
56

40 20 0 40 80 Miles



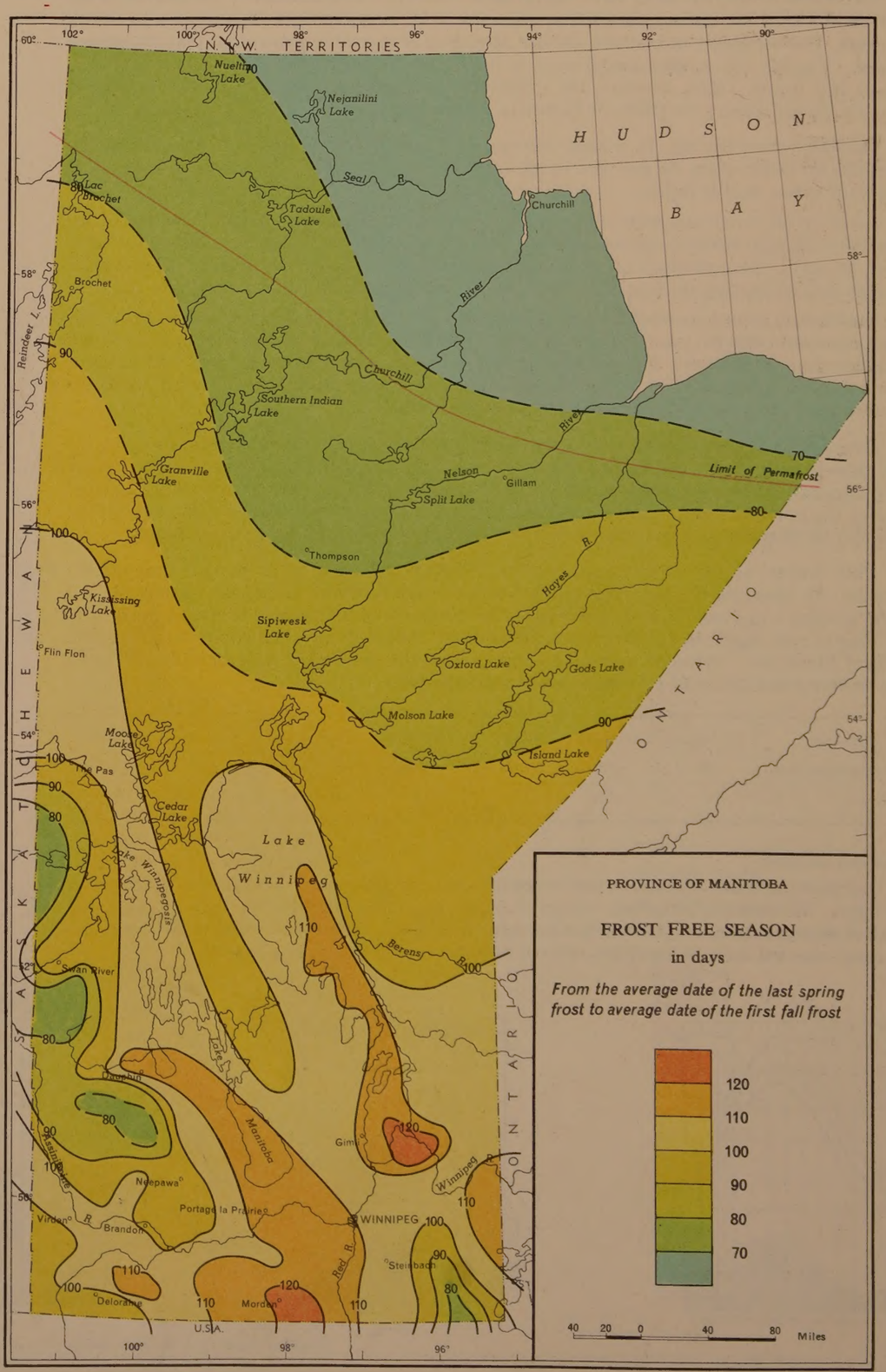
PROVINCE OF MANITOBA

AVERAGE TEMPERATURE
JANUARY

degrees Fahrenheit

2
0
– 5
– 10
– 16
– 20

40 20 0 40 80 Miles



PROVINCE OF MANITOBA

FROST FREE SEASON
in days

From the average date of the last spring frost to average date of the first fall frost

120
110
100
90
80
70

40 20 0 40 80 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

PRECIPITATION and GROWING SEASON

Precipitation

The annual precipitation including the water equivalent of snow (10:1) varies from 13 inches in northern Manitoba to 22 inches in the southeast. Based on the 30-year period 1921-1950, the annual total varies from 17 inches in the southwest to 22 inches in the southeast, the former figure being an inch higher than previous records usually indicated. This is in marked contrast to the "dry belt" associated with southeast Alberta and southwest Saskatchewan which receive only 12 inches. Manitoba's ample precipitation is related to the more frequent incursions of tropical air in the summer (arriving mainly in the upper layers) and to its location in a zone where both summer and winter frontal activity is greater than areas to the west. It is questionable whether orographic lifting is significant in Manitoba. The prevailing winds are from the north, northwest and south. Consequently, the Manitoba Escarpment facing east is not significant; nor is the gradual rise to the surface of Duck and Riding Mountains of air moving southeastward from Saskatchewan. In fact, the few stations to the west and southwest of Riding Mountain are drier than those elsewhere in southern Manitoba. The absence of stations on the "mountains" makes it impossible to know the annual precipitation there; however, based on the forest growth, amounts may be greater than in the lowlands of the vicinity.

There is a progressive decrease in precipitation as we go into central and northern Manitoba due to (1) the lower moisture content of Arctic air which predominates at all seasons, (2) the less intense surface heating in summer and (3) the decrease in frontal activity.

Seasonal Distribution—Of great significance to agriculture in the province is the fact that the six months, May to October, receive about 70 percent of the annual total; while the three critical growing months, May to July, receive 40 percent of the total, based on southern stations (see graphs). The graphs show a similar pattern: three to four inches in June, somewhat less in July, with August receiving slightly more than May. The occurrence of fall precipitation is quite important to the amount of soil moisture available for plant growth the following spring. In northern stations, the maximum comes in late summer. The map (plate 8A) indicates that the south central part of the province actually receives more rain in the early summer (May to July), but the Red River Valley soils are more moisture-retentive. It is this concentration of moisture in the early summer months that makes the spring-sown grains the crops best adapted to the region. Although cyclonic activity is less, the increased precipitation in the summer months is related to higher moisture content of the air, and greater surface heating touching off convectional rainfall.

Of equal significance to seasonal concentration is variability from year to year. Precipitation fluctuations in Manitoba have not been as great as in other Prairie Provinces. After a few below-average years in the 1890's, the moisture curve rises until 1913, then falls until 1921. The years 1932-36 and 1951-52 were abnormally dry, but since 1953, have been well above normal.

It is generally true that areas of lowest annual precipitation are likely to suffer from greatest annual variability. This is so in southwestern Manitoba, and is reflected in the natural vegetation (plate 10) and soil type (Shallow Black) characteristic of this sub-region. Dependability increases in the parkland and is greatest in the forested sections to the east. Of the various parts of agricultural Manitoba, deviations from the annual average are greatest in the southwest, especially along the Saskatchewan border. Based on station records from 1883 to 1938, maximum variability from the average (17.6 inches) was from 10.2 to 27.8 inches. From year to year, amounts of rainfall vary by 10 to 21 inches. Dry years may be expected more frequently than wet years, giving to this corner of the province a greater degree of uncertainty.

In south central Manitoba the annual precipitation (averaged over 59 years) is 18.3 inches, about an inch more per year than the southwest. During 10 percent of the years, the rainfall was below average (from 12 to 15 inches); and for the same percentage of years it was above average (21 to 25 inches). During 66 percent of the years, it varied from the norm by only 2 inches. Thus, the south central area has less variability than the area to the west.

To the east in the Red River plain precipitation variability is approximately the same as in the south central area, but the larger annual precipitation of 20 inches reduces the margin of critically dry years. The variability of northern stations appears to be as great or greater than that of southern stations. The Pas with a mean annual figure of 16.7 inches has received as low as 8.6 inches and as high as 26.2 inches. Here, however, the variability tends to be above average. Norway House shows the same degree of variability as Pierson in the southwest.

Snowfall—Manitoba has, in amount and regime, a snowfall more typical of eastern Canada. Exceeding 60 inches along the east and in the Interlake area, the amount decreases westward and northward to less than 45 inches.

Based on the water-equivalent of snow, the winter six months receives about 30 percent of the annual precipitation owing to the dominance of cold, dry Arctic air over the region much of the time. As we go north, the percentage of snow in the annual total increases only slightly (Churchill 35 percent) notwithstanding the long winter and the fact that some snow falls ten months of the year.

Variation in annual snowfall is well illustrated by Winnipeg. The average is 51 inches. The lowest on record (1928-29) was 22.7 inches, whereas the highest (1955-56) was 99.5 inches. Although these are absolute extremes, the seasonal amount fluctuates widely between them. Measurable snow has never fallen in July or August, and in June only once on record. Monthly totals for November to March are fairly uniform throughout the south.

Blizzards—The word "blizzard" is used to describe a storm in which the wind is strong enough to drift snow to such heights and in such quantities as to reduce visibility to 200 yards. These occur more frequently in the open plains, and in the tundra; however, they are less common in the forested areas of the province. Blizzards are no longer the hazard they were in earlier days, but drifting snow may tie up traffic for a few hours or a day or two depending on the severity of the storm.

Hail—Almost all hail falls in thunderstorms in which the ascent of air is more than usually vigorous. In Manitoba it is commonest in the southwest and decreases to the east. Damaging hail occurs in strips 1 to 4 miles in length formed by the movement of the storm. It is most frequent in mid-June to mid-August in late afternoon and evening. Although rare, hail occurs occasionally in northern Manitoba. Averaged over a ten year period, the number of days annually in which thunderstorms and hail occur for selected stations is as follows:

Station	Winnipeg	Minnedosa	Rivers	Dauphin	The Pas	Gillam	Churchill
Thunderstorms (days)	23	24	25	23	18	10	6
Hail (days)	1.3	2.7	2	1.7	unknown	occasional	rare

Growing Season

The most important climatic factors responsible for plant growth are temperature, water supply and light. All three are intimately related in plant geography. In addition, light intensity and length of daylight are also significant, but less well understood. Wind is of considerable importance and enters into the study of water loss referred to under evapotranspiration, page 18.

Two measures of temperature are commonly employed to explain the growth and distribution of crops: (1) frost-free season and (2) growing degree-days.

1. *Frost-Free Season*[1] (plate 7)—Of unusual concern to those engaged in agriculture is the duration of the frost-free season. For sake of uniformity the data presented on the map is the average frost-free season based on 32 degrees, although the staple crops of the region may not be affected until the temperature has dropped to 28 degrees. Generally speaking 100 days frost-free is still critical to wheat irrespective of shorter-ripening varieties having been developed. For the coarse grains 90 days may be regarded as a reasonable lower limit. These isolines have been plotted on the map, and their positions may be taken as the outer limits of possible agriculture assuming factors of soil and drainage are also favourable. In the north the longer hours of daylight offset to some extent the shorter season of growth. The following table sets forth the minimum, mean and maximum frost-free season for those stations graphed, excepting Bissett.

FROST-FREE SEASON[2]

(For station location see map page 18 and graphs pages 14, 16 and 18)

Station	Elevation (ft.)	Spring Frost			Fall Frost			Frost-Free Days (Av.)
		Average	Earliest	Latest	Average	Earliest	Latest	
Brandon	1,200	June 3	May 2	July 3	Sept. 7	Aug. 3	Oct. 1	96
Minnedosa	1,690	June 3	May 2	July 3	Sept. 4	Aug. 4	Sept. 27	93
Portage la Prairie	857	May 20	April 22	June 26	Sept. 24	Aug. 23	Oct. 18	127
Russell	1,832	June 8	May 10	July 12	Aug. 29	July 16	Sept. 27	82
Morden	991	May 22	April 26	June 20	Sept. 22	Aug. 26	Oct. 17	123
Ninga	1,649	May 27	May 12	June 20	Sept. 9	Aug. 23	Sept. 23	105
Sprague	1,085	June 13	May 4	July 15	Aug. 24	July 16	Sept. 19	72
Winnipeg	770	May 27	April 26	June 25	Sept. 15	Aug. 21	Oct. 16	111
Bissett	.....	May 20	May 8	June 1	Sept. 18	Aug. 22	Oct. 1	121
Gimli	725	May 30	May 7	July 6	Sept. 19	Sept. 2	Oct. 1	112
Dauphin	957	May 24	May 9	June 16	Sept. 17	Aug. 22	Oct. 5	116
The Pas	890	May 30	May 7	July 12	Sept. 9	Aug. 8	Oct. 11	102
Churchill	44	June 28	June 7	July 15	Aug. 30	July 16	Oct. 2	63
Gillam	454	June 28	June 13	July 15	Aug. 31	Aug. 16	Sept. 12	64

Variation in length of frost-free season will depend on (1) elevation, (2) local topography and drainage, (3) the location of the recording station. Areas which are highland such as the upper surfaces of Duck and Riding Mountains experience early fall frosts. The uplands cool rapidly at night by radiation, and minimum temperatures for the region are soon reached. While the lowest "pockets" or depressions such as bogs and hollows experienced both late and early frosts, in general lowlands have a longer growth period than uplands. The valleys of the major rivers in southern Manitoba reflect this, as well as the lowland west of the escarpment. Valleys cool more slowly at night.

Topographic control is also highly significant. Air drainage prolongs the season at the base of the escarpment, accounting undoubtedly for the anomaly at Dauphin. The tongue of cool climate extending deep into the Interlake region marks the path of invading cold air from the north increasing the hazard of late spring frost. The large lakes, especially Winnipeg, have a notable influence. The shores adjacent, especially the east side, have a retarded spring but a prolonged fall. There are sufficient stations along the southeast shore of Lake Winnipeg to confirm the fact that this section has one of the longest seasons in the province (Great Falls, 127 days). Undoubtedly the retarding effect of the lake is important to any explanation. The incidence of a cloud cover, as commonly reported in the fall around The Pas and south along the escarpment, is undoubtedly a factor. The Pembina Triangle and the vicinity of Portage la Prairie are other areas of unusual length. In the southeast, the presence of low-lying swamp and bog makes for a short season while elevation on the flanks of Riding Mountain and in the Swan River Valley are significant in reducing the length to less than 100 days.

2. *Growing Degree-Days*—As a measure of the vegetative period or physiological activity, the growing degree-day is now widely accepted. It may be defined as the accumulation of degrees of temperature above a daily mean of 42 degrees. Throughout the greater part of Canada, this period does not extend beyond May 1 to November 1. A temperature of 42 degrees was selected because this marks for many plants the minimum temperature for growth.

The method used for calculating degree-days was that outlined by B. W. Currie[3], in which the monthly mean temperatures above 42 degrees were graphed for each station for the length of record. These were plotted on the map of Manitoba and isolines drawn as indicated on plate 8. It represents temperature conditions optimum for growth and correlates closely with the isotherms for July (plate 7). From the central axis of the Red River valley where the number of degree-days exceeds 3,000 there is a decrease outward. It is particularly rapid eastward. Most of south central Manitoba exceeds 2,700. The line curves northward over Lake Winnipeg showing the moderating effect of the water on the climate in its vicinity. The longer vegetative period in the Dauphin plain stands as an outlier. North of Flin Flon the decrease to Hudson Bay is more rapid, but the longer day has a compensating effect. Nevertheless, at Churchill, the period is 740, or one-quarter that of the Red River valley. The influence of the adjacent cold waters serve to reduce the period of growth. This is the edge of the tundra. As might be expected, variations in growing degree-days occur annually. Thus Churchill in 1958 had 611 degree-days whereas in the previous year it had 1,031[4].

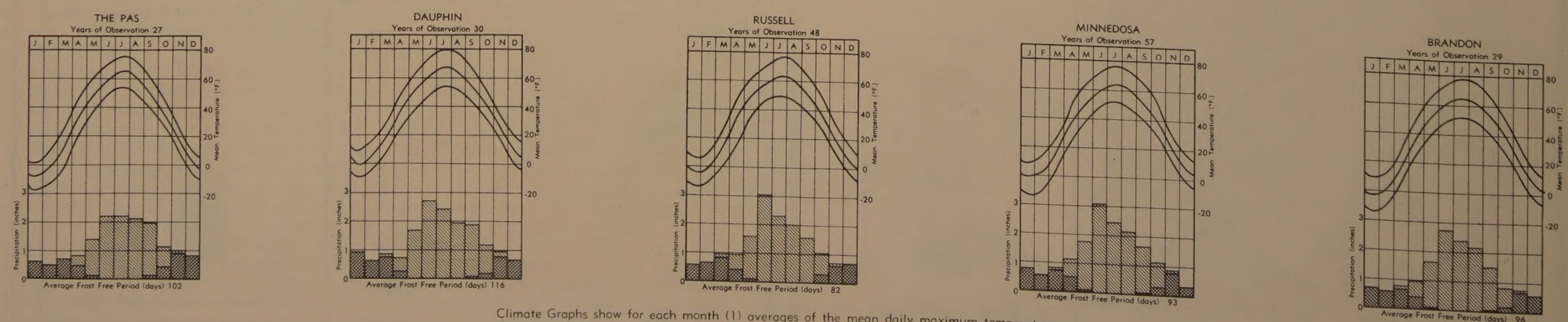
Permafrost—The northern limit of permafrost is shown on the map of frost-free days, plate 7. This line is tentative awaiting further information. The progression from sporadic occurrences of permafrost to areas of continuously frozen ground is a broad band extending from 54°N.L. to Churchill. The line indicated on plate 7 shows the approximate boundary between scattered occurrences, and discontinues areas of permafrost. The line of continuous permafrost follows more closely the boundary of Tundra on plate 10.

[1]Meteorological Division, Dept. of Transport, "Climatic Summaries" **Frost Data**, vol. 3, Toronto, 1956.

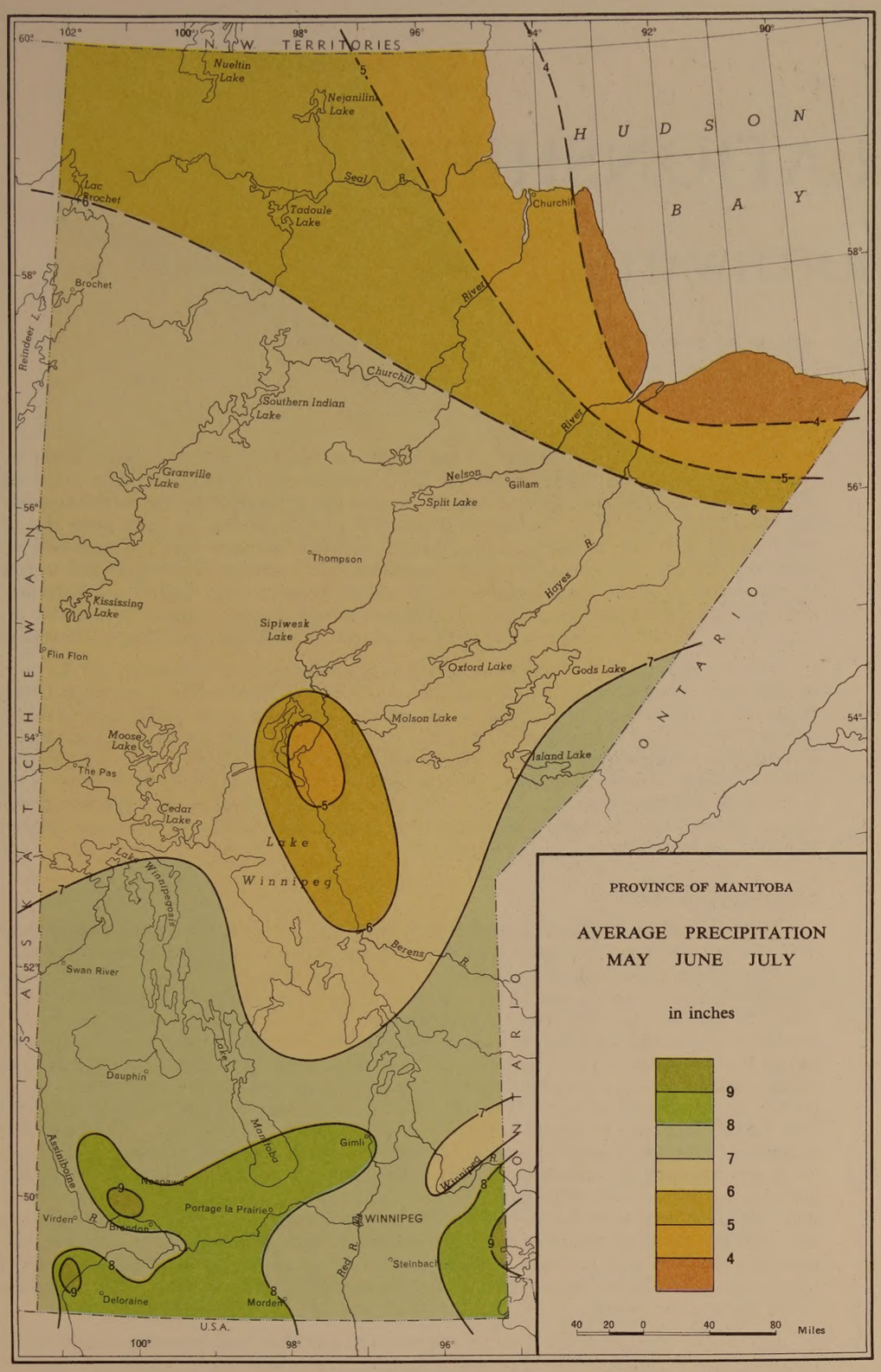
[2]Ibid p.34.

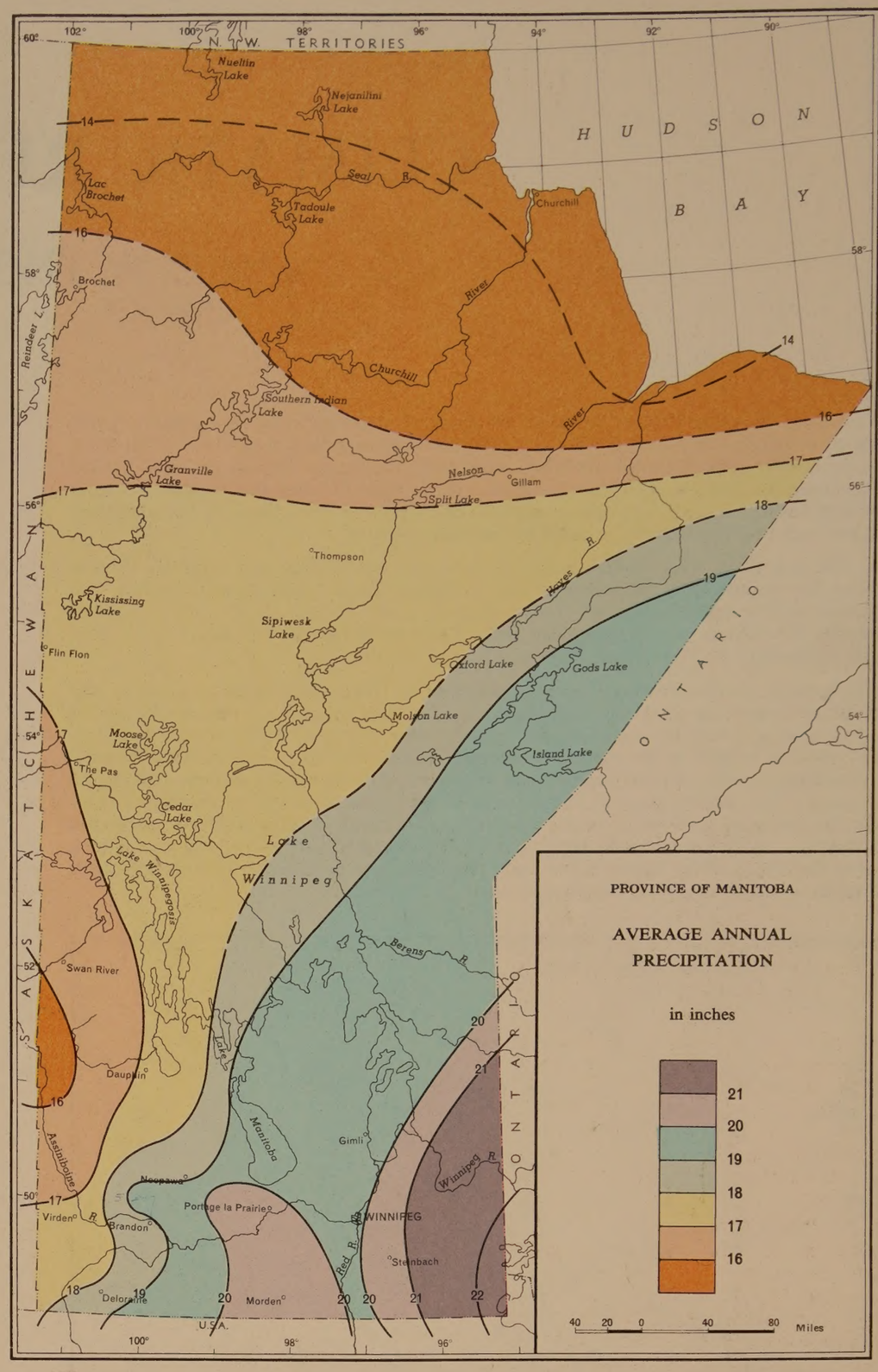
[3]Currie, B. W., "Prairie Provinces and Northwest Territories Vegetative and Frost-Free Seasons," Physics Dept., University of Saskatchewan, January, 1954.

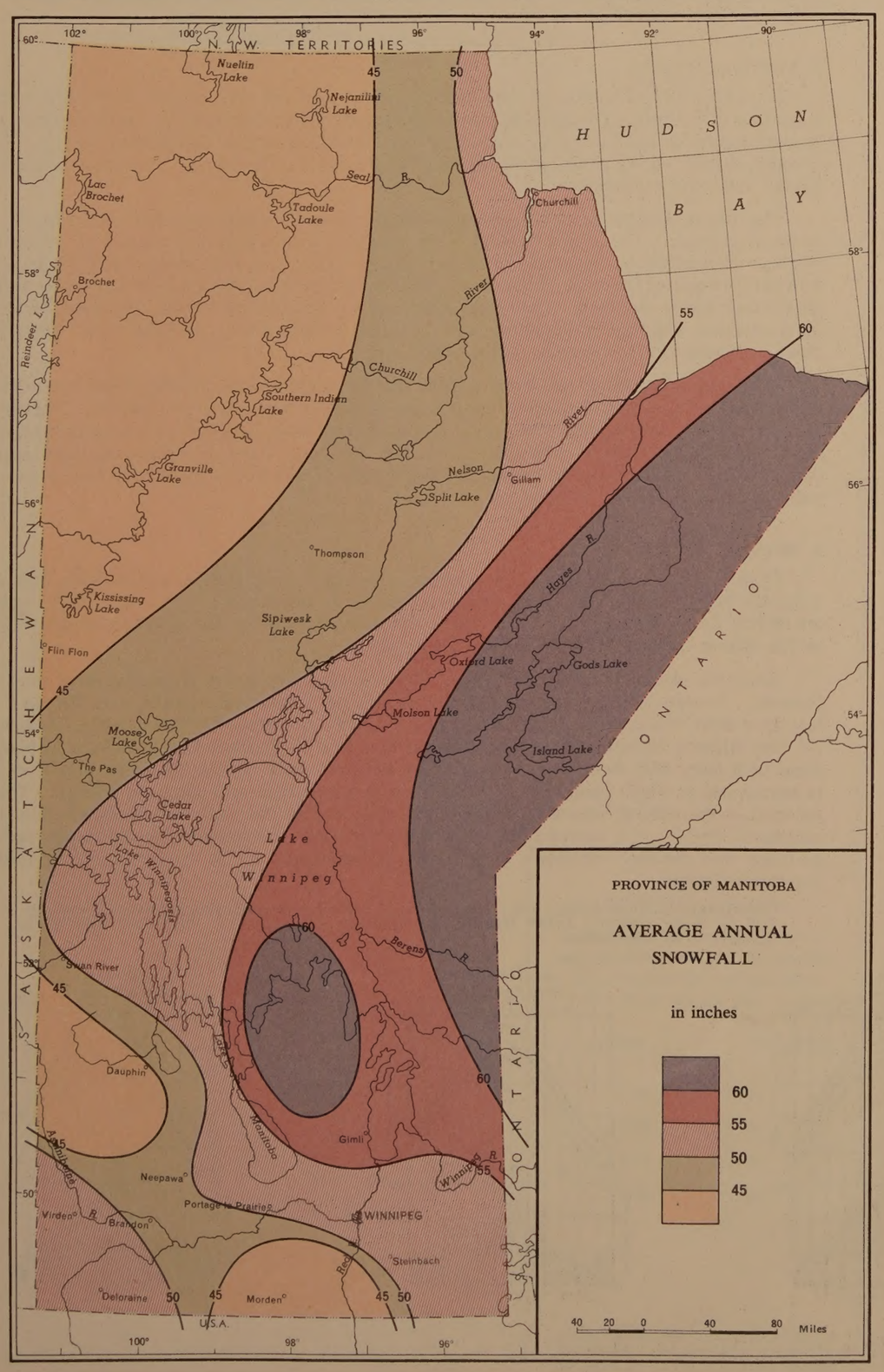
[4]Boughner, C. C. and Kendall, G. R., "Growing Degree-Days in Canada," Dept. of Transport, Meteorological Branch, May, 1959, page 15.

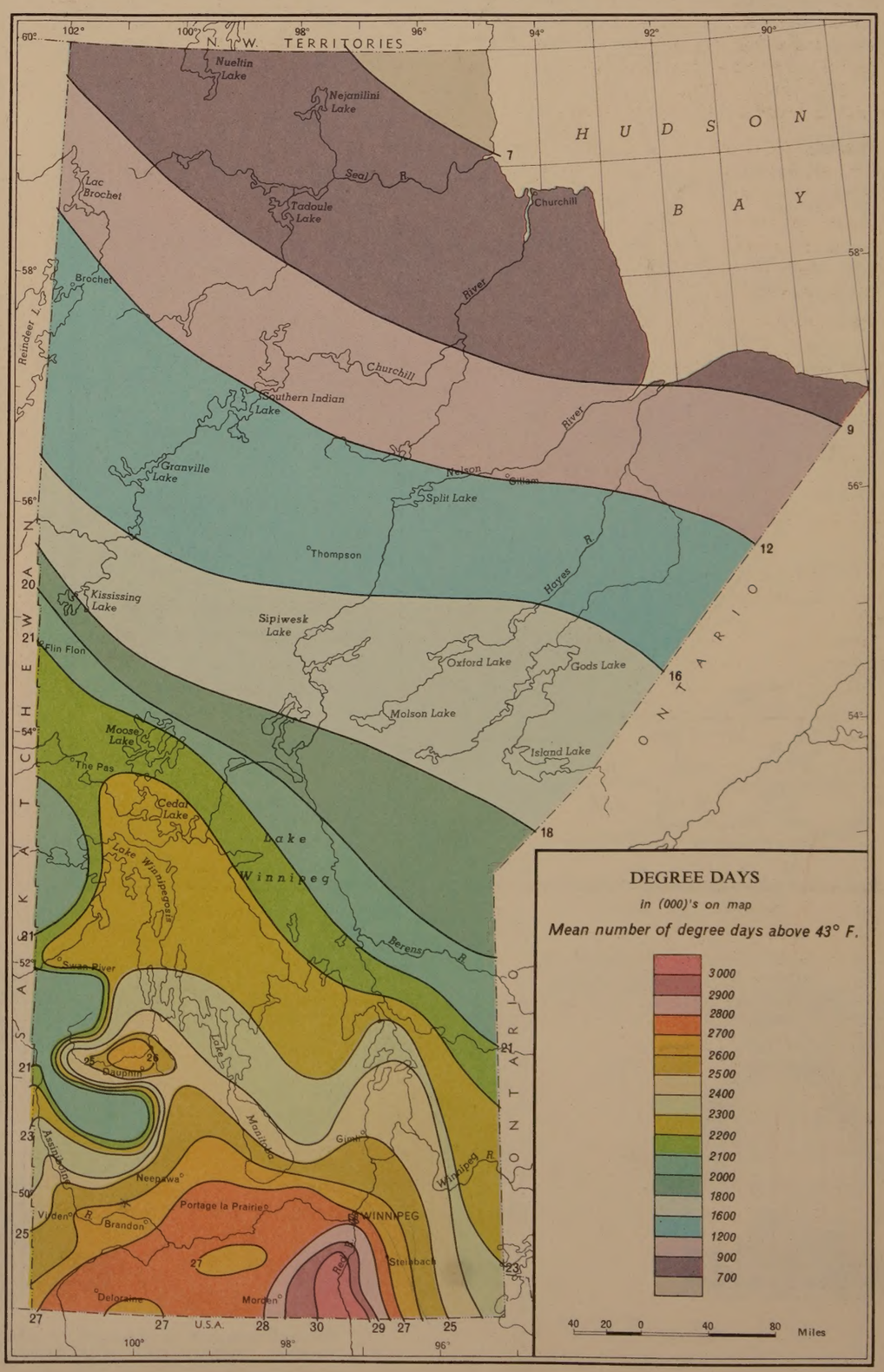

THE PAS
Years of Observation 27
Average Frost Free Period (days) 102
DAUPHIN
Years of Observation 30
Average Frost Free Period (days) 116
RUSSELL
Years of Observation 48
Average Frost Free Period (days) 82
MINNEDOSA
Years of Observation 57
Average Frost Free Period (days) 93
BRANDON
Years of Observation 29
Average Frost Free Period (days) 96
J F M A M J J A S O N D
Mean Temperature (°F.)
Precipitation (inches)

Climate Graphs show for each month (1) averages of the mean daily maximum temperatures, the mean, and the mean daily minimum temperatures (degrees F.), (2) average total precipitation including snowfall (equivalent) and rain, (3) average frost free period in days, for 13 representative stations.









PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

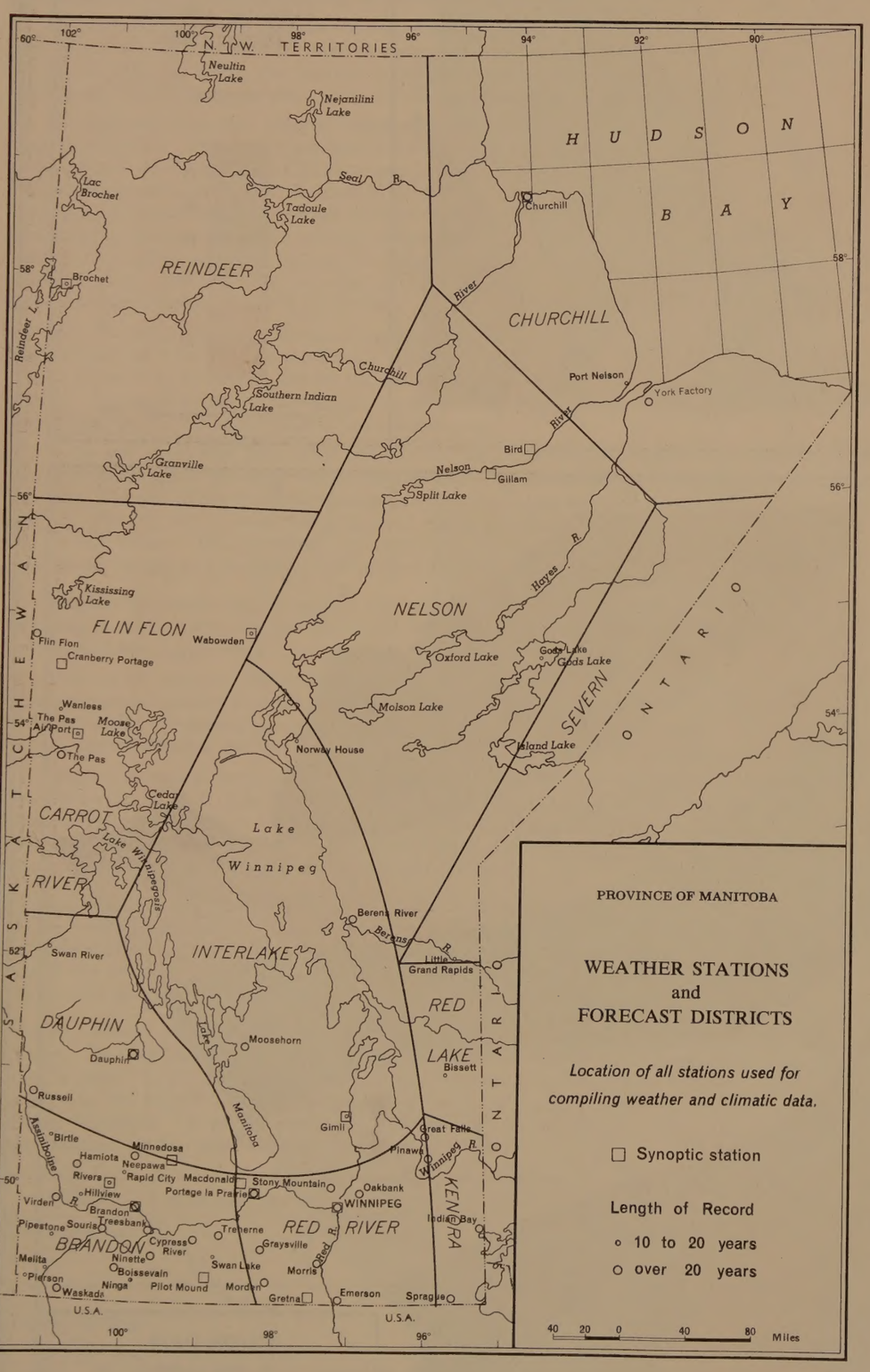
CLIMATIC RELATIONSHIPS

after C. W. THORNTHWAITE

Ever since Wladimir Koppen began his mapping of temperatures in 1884 many different approaches to the classification of climate and its components have been attempted. Until about 1930 most of these climatic studies were partly subjective in character and did not really use the climatic elements exclusively as the basis for classification. Many climatologists attempted to work out systems based on an analysis of meagre climatic and vegetation data, but with limited success. It was not until 1948 that a widely accepted method was presented.

In that year C. W. Thornthwaite published his revised classification, and since that time he and others have presented further refinements to the original system. Thornthwaite's system is of particular interest in agricultural regions as it deals directly with the amount of available moisture as related to the moisture need of a particular area. The maps which follow are based on the latest methods as presented by Thornthwaite and his associates in 1955.[1]

The basis for the classification of climates according to Thornthwaite is the exchange of heat and moisture between the earth and its atmosphere. The "heat budget" has been widely studied and a vast amount of data has been compiled. On the other hand, very little work has been done on the "moisture budget" of the earth. A few studies have been made, but the water balance, (the relationship between moisture supplied and moisture need) has not been well understood until recent years. After many attempts, Thornthwaite derived a mathematical formula which made possible the calculation of the water need for a particular station without doing extensive and detailed measurements. All that was needed were the monthly averages of temperature and precipitation as well as the latitude of the station in question. The calculation of the water need resulting from this formula is called "potential evapotranspiration".



1. Potential Evapotranspiration

Evapotranspiration, a compound of the two words "evaporation" (the loss of water to the atmosphere from the soil, lakes, streams, etc.) and "transpiration" (the loss of water to the atmosphere by plants), represents the total loss of water to the atmosphere by the earth's surface at a particular point. The word "potential" is included to indicate that in some areas the actual evapotranspiration may be less than the potential, and this difference indicates areas deficient in moisture. By definition "potential evapotranspiration" is that amount of moisture which is required to meet the needs of (1) direct evaporation, (2) soil moisture recharge, and (3) maintenance of a geographically continuous forest cover, presumably a broadleaf forest. Hence in areas too dry to support a deciduous forest cover there is a net annual moisture deficiency according to Thornthwaite.

The first map (plate 9) shows the potential evapotranspiration in millimeters for the province of Manitoba. The general pattern of the isolines is related to the factors of temperature and latitude. In the areas of higher average annual temperature in the western and southern portions of the province the potential evapotranspiration is the highest. It generally decreases as one goes north, reflecting the influence of Hudson Bay where cooler temperatures reduce the rate of water loss and cause the isolines to parallel the coast. Another smaller modification by open water bodies is shown in the vicinity of Lake Winnipeg. It also should be noted that the potential evapotranspiration is a rough index of heat and light available for plant growth, since it is based upon temperature and latitude (compare "Degree Days", plate 8).

2. Moisture Deficit

When the potential evapotranspiration for a given area is known, it becomes possible to determine the moisture deficit by calculating the difference between the actual precipitation and the potential evapotranspiration (water need). This difference is found by subtracting the potential evapotranspiration from the rainfall for each month and totalling the negative differences for the year. In some months the potential evapotranspiration equals or exceeds the precipitation during which the soil begins to dry out and lose moisture. This water shortage is shown in the map of *average moisture deficit* as a total for those months having a deficit. In Manitoba the deficit occurs mainly during the period from May through September, that is during the growing season, and is greatest in the south and west. It should be remembered that this calculation of water deficit does not take into consideration local drainage or soil conditions, so that for a local area there may actually be a surplus of water for part of the period shown as a deficit. This applies particularly to the areas of heavy clay soils of the Red River and lower Assiniboine River valleys where drainage problems are encountered. On the other hand a sandy area such as the Assiniboine Delta may suffer greater deficits than the average for the area as a whole. This map is highly generalized indicating that for some month or months in an average year most parts of the province will experience a deficit of moisture, even in portions of the boreal forest and tundra regions. To some this may be surprising, but persons familiar with the area know there are times of extended drought during the summer months.

Part of the problem in the north of the province is that a large percentage of the moisture received cannot be utilized. The soil remains frozen after the snow begins to melt and much of the moisture is lost as run-off.

3. Moisture Surplus

For a very limited number of stations in Manitoba there are some months during which there is an *excess* of moisture. During these months the actual precipitation equals or exceeds the potential evapotranspiration and there is some moisture available which is called the moisture surplus. This moisture surplus occurs either in the spring or in the fall during times of significant amounts of rainfall and lower temperatures.

The map of Average Moisture Surplus shows the areas of surplus for those months having an excess of moisture. The areas northeast of the zero line have at least one month with a moisture surplus. Here again the dual effects of latitude and the influence of Hudson Bay can easily be seen. As would be expected the grass-parkland portions of the province do not experience a moisture surplus at any time during the year. The boreal forest and tundra portions are the only areas which do show a surplus, while the gradation through the mixed deciduous forest into the "true" grasslands closely corresponds to the zero line on the map.

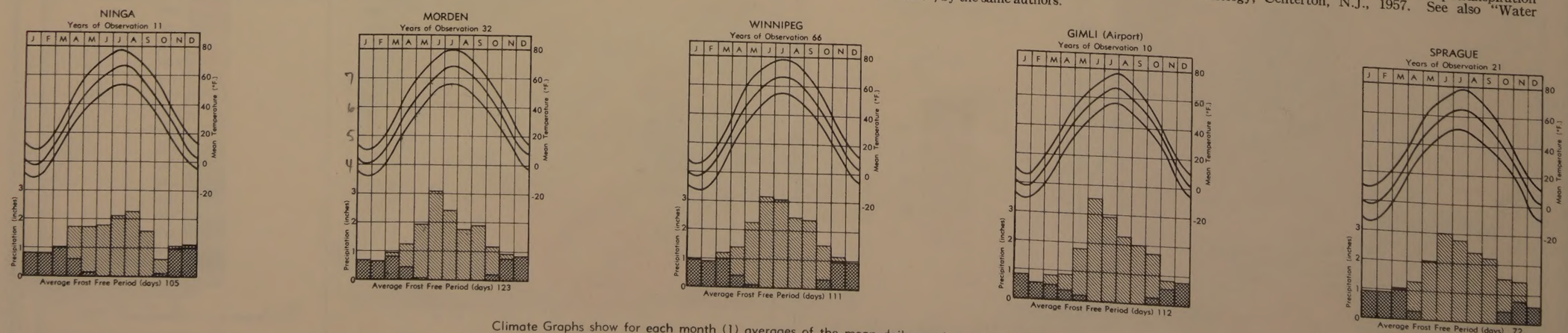
A comparison of Maps 2 and 3 above shows that everywhere in the province at least one month has a deficit while a part of the province has one or more months showing a surplus. The southeast part of the province falls within this category having larger amounts of annual precipitation combined with a relatively cool summer. In the southwest, however, where potential evapotranspiration is high, no months have a moisture surplus as reflected in the natural vegetation, the soil type and a history of dry years.

4. Moisture Regions

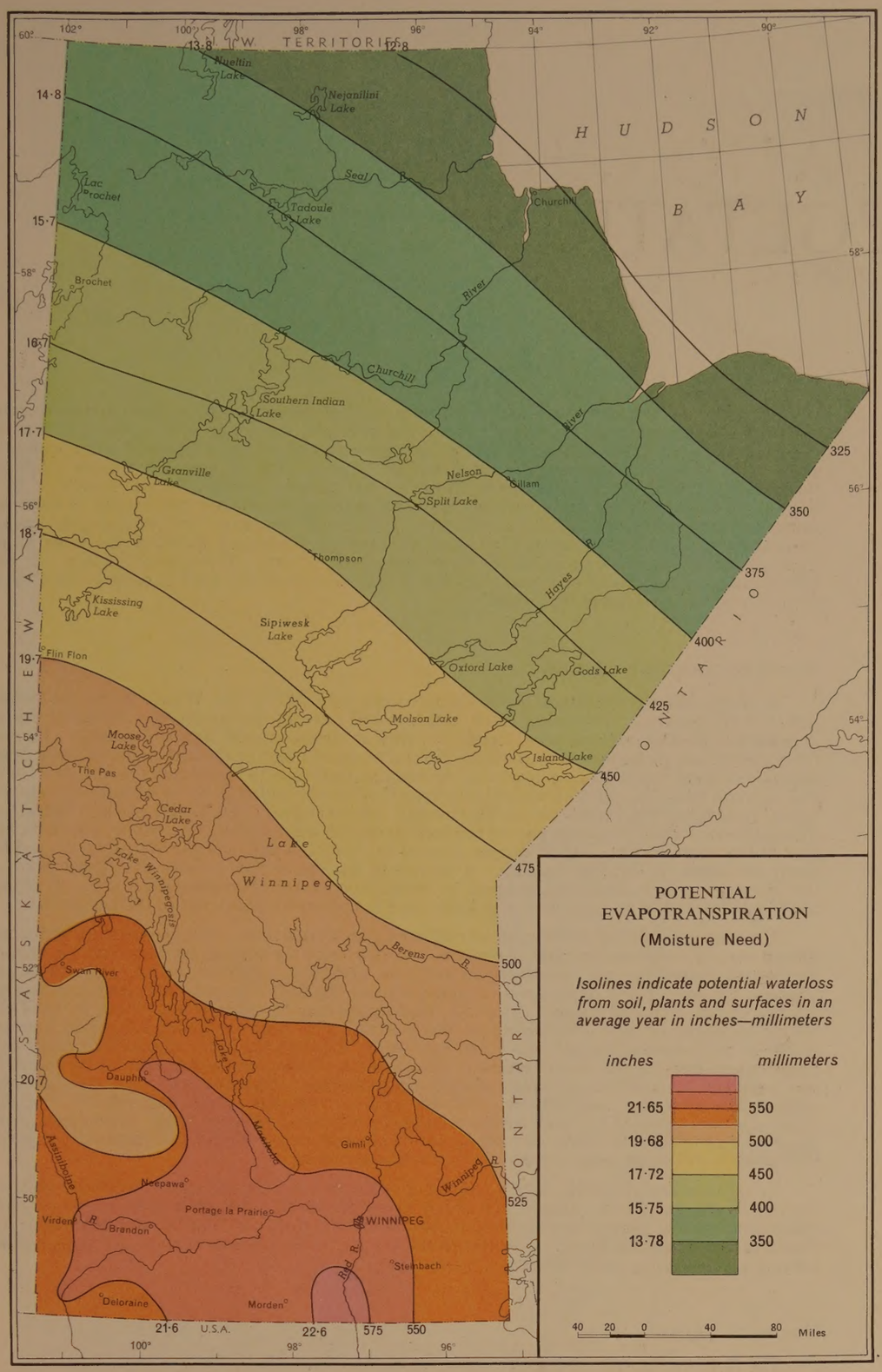
From a study of the relationships between temperature, precipitation, and latitude, Thornthwaite has derived a climatic classification expressed as moisture regions (plate 9). These regions are derived from a formula involving values of annual moisture deficit and moisture surplus. Lines on the map of Average Moisture Regions are generalized.

Where the surplus is equal to the deficit, the moisture index is zero separating moist from dry climates. In areas with an index above zero there is a net annual water surplus even though there may be a short deficit period some time during the year. In areas of negative indices (especially the "dry fringe") vegetation growth is restricted by a lack of moisture, that is, relative to what it could be if more were available. Manitoba lies, therefore, in a climatic transition zone from dry to humid, one in which small changes in moisture or temperature will upset the balance. This is reflected in the natural vegetation ranging from grassland in the southwest through parkland to continuous forest. It is further reflected in minor variations in topography and drainage, such as southerly and northerly exposures in hill land, or depressions in flat land resulting in marked vegetation changes.

[1]Thornthwaite, C. W. and Mather, J. R., "Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance", Drexel Institute of Technology, Centerton, N.J., 1957. See also "Water Balance", by the same authors.


NINGA
Years of Observation 11
Average Frost Free Period (days) 105
MORDEN
Years of Observation 32
Average Frost Free Period (days) 123
WINNIPEG
Years of Observation 66
Average Frost Free Period (days) 111
GIMLI (Airport)
Years of Observation 10
Average Frost Free Period (days) 112
SPRAGUE
Years of Observation 21
Average Frost Free Period (days) 72
J F M A M J J A S O N D
Mean Temperature (°F.)
Precipitation (inches)

Climate Graphs show for each month (1) averages of the mean daily maximum temperatures, the mean, and the mean daily minimum temperatures (degrees F.), (2) average total precipitation including snowfall (equivalent) and rain, (3) average frost free period in days, for 13 representative stations.

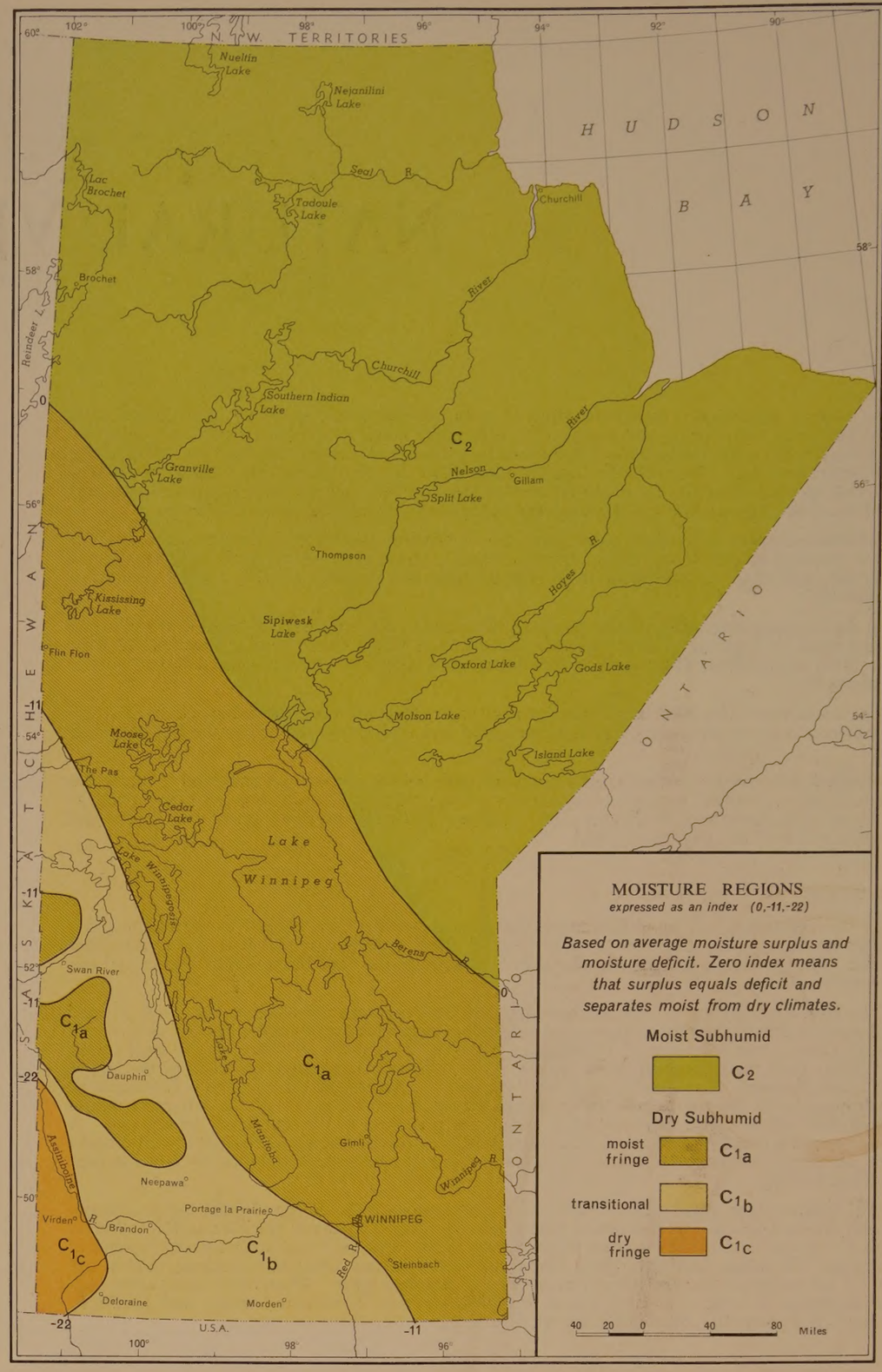


POTENTIAL EVAPOTRANSPIRATION
(Moisture Need)

Isolines indicate potential waterloss from soil, plants and surfaces in an average year in inches—millimeters

inches	millimeters
21·65	550
19·68	500
17·72	450
15·75	400
13·78	350

40 20 0 40 80 Miles



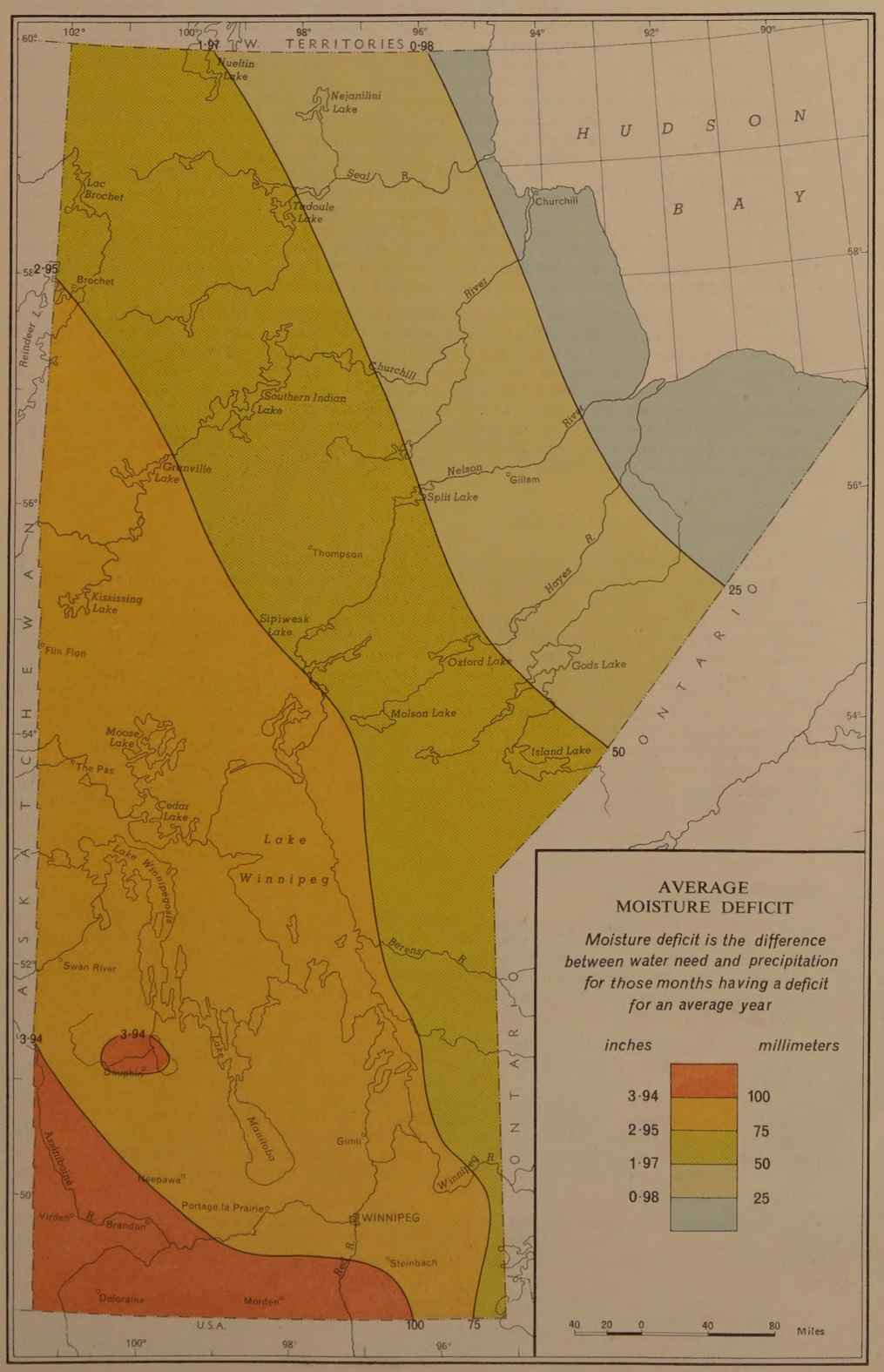
MOISTURE REGIONS
expressed as an index (0,-11,-22)

Based on average moisture surplus and moisture deficit. Zero index means that surplus equals deficit and separates moist from dry climates.

Moist Subhumid — C_2

Dry Subhumid
- moist fringe — C_{1a}
- transitional — C_{1b}
- dry fringe — C_{1c}

40 20 0 40 80 Miles

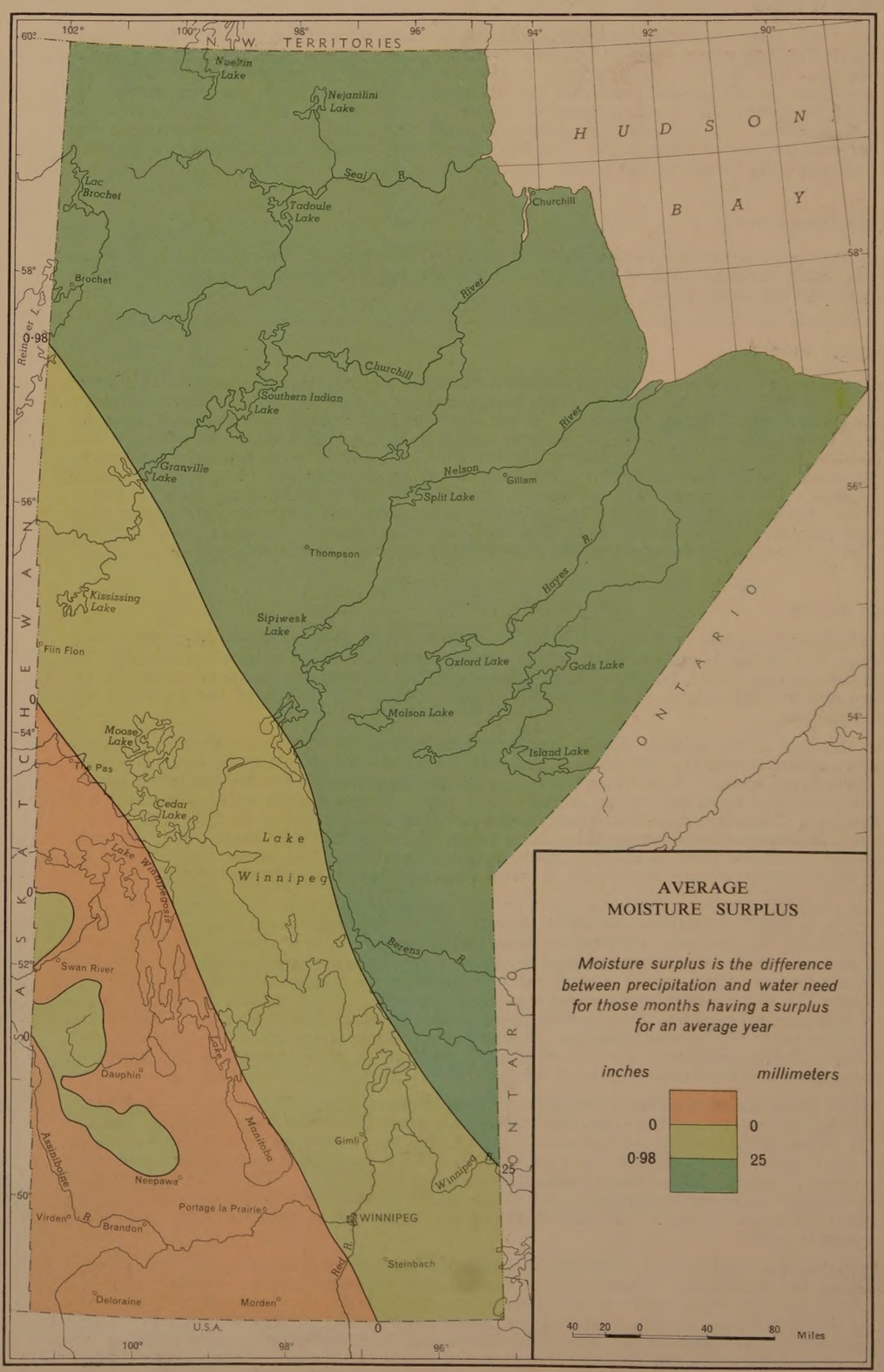


AVERAGE MOISTURE DEFICIT

Moisture deficit is the difference between water need and precipitation for those months having a deficit for an average year

inches	millimeters
3·94	100
2·95	75
1·97	50
0·98	25

40 20 0 40 80 Miles



AVERAGE MOISTURE SURPLUS

Moisture surplus is the difference between precipitation and water need for those months having a surplus for an average year

inches	millimeters
0	0
0·98	25

40 20 0 40 80 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

NATURAL VEGETATION

By natural vegetation is meant the kinds of plant life that would be found in an area if such natural factors as soil, climate and topography were solely involved in plant growth and survival. Man, however, has upset the balance of natural factors through settlement and land use, particularly in southern Manitoba.[1] Notwithstanding, the map (plate 10) reconstructs in general the natural cover prior to settlement for the southern part of the province and portrays the present natural vegetation in the forested lands to the north not yet appreciably influenced by settlement.

Extensive changes have taken place since early settlement and much of the natural vegetation has been replaced by cultivated crops. In most districts however, remnants of the original vegetation remain, and wherever cultivation is abandoned, there is a tendency for this original vegetation to be restored.

In the forest zones tree distribution has been influenced by the prevalence of forest fires and in the southern areas by logging. These initiate a succession of forest cover usually commencing with poplar, birch or jack-pine, which if no further disturbance takes place tend to be replaced by spruce and balsam fir.

The boundaries of the Northern Transition and the Arctic Tundra have been drawn from information obtained from various sources, such as geological and exploratory surveys and a few botanical surveys.

Southern Manitoba is located on the transition zone between forest and grassland. Hence the balance of factors involved in the survival of these major groups of plant life is easily upset, particularly by seasonal variations in climate. The map sets forth the resulting gradations from short grass prairie to northern coniferous forest.

Open Grassland

Of the vegetation regions of Manitoba, the grasslands have been subject to the greatest disturbance by human activities. As a result of cultivation, grazing and fire little native grassland remains. The grasslands may be considered in two sections, the Red River Valley region and the southwestern region.

The Red River Valley is generally considered to be a northern extension of the "true prairie" or tall-grass prairie of the United States and indeed it is similar to the adjoining Red River lowlands of North Dakota and Minnesota. Floristically however, the Red River Valley, due to local conditions, differs from the typical tall grass prairie. This difference stems from its origin as the bed of glacial Lake Agassiz. The heavy impervious soil and the flatness of the country is conducive to poor drainage with the result that the dominant grasses are those species of the tall grass prairie which thrive best in moist localities, while sedges are prevalent in the undrained depressions. A fringe of woods is usually found along streams including bur oak and aspen on the higher well drained banks and elm, basswood, cottonwood, Manitoba maple and green ash on the river lowlands subject to periodic flooding.

The southwestern grasslands of Manitoba are continuous with the mixed prairie of Saskatchewan and North Dakota. In this mixed prairie are found constituents of the flora of the tall-grass prairie to the east and the short-grass plains farther west. Communities dominated by species of grama-grass (*Bouteloua*) and spear grass (*Stipa*) represents mature grasslands, replaced on local soil types by *Muhlengergia cuspidata* and *Poa*, species of meadow grass. Overgrazed areas show considerable change in cover, with such species as prairie sagewort (*Artemisia frigida*), and Kentucky blue-grass (*Poa pratensis*), becoming common.

Sparsely Wooded Grassland

From the region of continuous grassland to the northern limit of the broadleaf forest region and also on the slopes of the Pembina hills and Turtle Mountain, there is a gradual transition involving a decrease in areas of grassland and an increase in shrubland and wooded areas. Within the grasslands and sparsely wooded grasslands local sites around lakes and in the shelter of ravines are dominated by shrubs, the commoner being saskatoon (*Amelanchier*), silverberry (*Elaegnus*), snowberry (*Symphoricarpos*), and dogwood (*Cornus stolonifera*). Aspen poplar (*Populus tremuloides*) and bur oak (*Quercus macrocarpa*) are the first tree species found in this transition and willows (*Salix sp.*) gradually become more common.

Wooded Grassland

In this zone trees increase to form groves of considerable size, locally known as "bluffs". Aspen poplar is usually dominant in these bluffs although balsam poplar (*Populus balsamifera*) is found in moist sites and oak on dry sites.

Broadleaf Forest

A zone of more or less continuous broadleaf or hardwood forest originally extended north and east of the wooded grassland and also occupied the upper slopes of the Pembina hills, Turtle Mountain and the lower slopes of Riding Mountain. A belt stretched from Selkirk northwestward along the shores of Lake Manitoba to Lake Dauphin and northwest to the Roblin area. An isolated patch occupied the Swan River Valley. Much of the zone has been cleared in the process of settlement. The dominant tree is aspen poplar but white birch is sometimes found and there is an occasional white spruce. Balsam poplar occupies moister sites and bur oak is found occasionally on locally arid sites. Among the shrubs hazel (*Corylus cornuta*) is common as an understory with aspen, while highbush cranberry (*Viburnum trilobum*) may be found along streams. Frequent grassy openings occur but the grass and herbaceous species belong more and more to woodland types.

Mixed Woods

As indicated on plate 10 this zone falls within a number of physiographic regions namely, Duck, Porcupine and Riding Mountain, much of the central lowlands, isolated areas of considerable size on the Precambrian Shield, an area of morainic and outwash sands in the southeastern part of the province and a small isolated sand dune and outwash area in the vicinity of the Spruce Woods Forest Reserve.

In the west on the uplands (Duck, Porcupine and Riding Mountain) mature forests of aspen and white spruce occupy the well drained sites with lesser amounts of balsam fir, especially in the older undisturbed stands. Sites where the vegetation has been disturbed by fire and felling usually bear pure stands of aspen and balsam poplar or jack pine. Stands of black spruce (*Picea mariana*) and tamarack (*Larix laricina*) occupy peaty areas and jack pine is common on drier sites. Hazel is often a dominant understory shrub in old aspen stands, while mountain maple (*Acer spicatum*) may occupy a similar position in white spruce-aspen associations. The minor vegetation of the upland forest consists of a rich assortment of boreal herbs and mosses as well as low shrubs.

The central lowland is a flat-lying area with high-lime surface deposits of varying depth, sometimes quite shallow. Lacustrine and fluvial deposits of good depth are found around bays of Lake Winnipeg, Lake Winnipegosis, other smaller lakes and along the course of rivers. The best timber stands are found on the lacustrine and fluvial deposits and here the main trees are aspen, white spruce, and balsam poplar. Black spruce of good quality is found on the margins of peaty areas, although the trees on the wetter central portions are stagnated in growth. Areas of more or less pure aspen or pure jack-pine are common, these trees being an early stage of succession after fire. Most of the shrubs which occur in southern Manitoba are found here to some extent but alder (*Alnus sp.*) and dwarf birch (*Betula glandulosa*) should perhaps be mentioned as more common in this and other sections of the mixed wood than they are in the vegetative zones previously described.

Mixed wood is found on the Precambrian Shield in parts of the Whiteshell Forest Reserve, along the north bank of the Winnipeg River, the rivers which drain into Lake Winnipeg from the east, the Nelson in the vicinity of Cross and Sipiwesk Lakes, the Burntwood and the upper Churchill Rivers and in many other locations. In most cases these areas have soil of good depth laid down as fine sediments in glacial Lake Agassiz or in other unnamed glacial lakes. The better drained areas produce excellent white spruce and aspen, while black spruce varies in size depending on the drainage. Jack-pine often occurs on excessively drained rock or sand ridges and as temporary cover after fire in spruce-aspen stands.

In the southeast corner of the province, a mixed wood forest covers most of the flat-lying country surrounding the Sandilands. Upland soils on the flanks of the ridge support secondary stands of aspen, jack-pine and white birch, with a little white spruce, while the dominant trees of wetter habitats are black spruce, tamarack, white cedar (*Thuja occidentalis*) and black ash (*Fraxinus nigra*). The presence in this region of red pine (*Pinus resinosa*), fragments of white pine forest (*Pinus strobus*), white cedar, black ash with rare occurrences of large-toothed aspen (*Populus grandidentata*) and other eastern species indicates a strong affinity with the Great Lakes-St. Lawrence forest region of eastern Canada.

Throughout the mixed wood belt, as elsewhere in fact, physiography and soil appear to control the precise distribution of vegetation types. For example, the sandy soils of the Carberry area including the Spruce Woods Forest Reserve are covered with an open forest of white spruce and aspen with the ground cover dominated by low shrubs such as creeping juniper (*Juniperus horizontalis*), bearberry (*Arctostaphylos Uva-ursi*) and ground cherry (*Prunus pumila*). In the openings between the trees prairie grasses are found growing in bunches rather than as continuous sward and commonly mingled with spike moss (*Selaginella rupestris*) and occasionally horsetail (*Equisetum sp.*). Black spruce and tamarack with balsam poplar are found on the lower ground. Curiously enough, jack-pine and balsam fir are completely absent. This appears to be a relic forest which on account of special soil conditions was able to survive in this sand dune area when the rest of the boreal forest retreated northward.

Northern Coniferous Forest

A predominantly coniferous forest extends from the Lake of the Woods in the southeastern corner of the province to Reindeer Lake, which is well towards the northwest. Much of this area is underlain by Precambrian rock formations with a comparatively thin soil mantle. However, the upper Nelson plain, known as the Clay Belt and formerly part of the bed of glacial Lake Agassiz has soils of good depth ranging from clay to loam in texture with some sandy tracts and areas of rock outcrop (plate 5). In addition to Lake Agassiz other unmapped glacial lakes no doubt deposited lacustrine sediments in various places, for example, around Oxford Lake, Gods Lake and Island Lake. The conferous forest also covers part of the area where the surface rock is limestone, especially along part of the west shore of Lake Winnipeg, around the northern part of Lake Winnipegosis and both north and south of The Pas marshes. A portion of the better soils in both the Precambrian and the limestone area is, however, occupied by mixed wood forest as mentioned above. A separate coniferous tract occupies the ridges of granitic sand in the southeastern part of the province.

Speaking generally of the Northern Coniferous Forest, this zone is characterized on undisturbed upland sites by a continuous forest of conifers. In this forest the spruces are dominant, white spruce on the well drained but not excessively drained sites, and black spruce on the less well drained sites. Towards the north black spruce tends to climb up over the drift hills and rock ridges carrying with it a rich carpet of ground mosses. After fire these stands may be replaced by a young forest of black spruce, jack-pine or aspen, depending on the availability of seed. Alluvial soils often bear good stands of white spruce, balsam poplar and balsam fir, although the latter species disappears before the northern limit of the zone is reached. Much of the region has been influenced by forest fires and secondary communities of trees and shrubs are common. Stands of jack-pine are common on upland sites after fire, especially on such dry substrata as sand plains and eskers. Peat-filled depressions are occupied by black spruce muskeg, a continuous forest of poorly grown trees, with a dense floor of ericaceous shrubs and sphagnum or other mosses. Wetter peat deposits are covered by treeless bog in which sedge species (*Carex*) are conspicuous.

In southeastern Manitoba there is an area of distinctive physiography and coniferous vegetation centred on the Sandilands, Agassiz and Belair Forest Reserves. Together they occupy an almost continuous tract of more or less elevated ground stretching from the International Boundary to the mouth of the Winnipeg River. The predominant cover of this sandy, upland site is jack-pine of varying age depending on fire history.

Northern Transition

The Northern Coniferous Forest Zone is bounded on the north by the Northern Transition. On the Shield portion to the northwest, the boundary between the two zones is sometimes remarkably sharp, the upland forest changing abruptly from close forest to open, park-like stands. To the east the boundary coincides approximately with the junction between the Shield and the Hudson Bay Lowland and here there are marked changes in relief and drainage pattern reflected strongly in vegetation cover. On well drained sites in the southern parts of the Shield the Northern Transition is characterized by spruce forests of well spaced trees with the ground vegetation of undisturbed sites consisting of low shrubs and a mat of lichens. These are the lichen woodlands characteristic of subarctic North America as a whole. However, in northern Manitoba there are few mature, well developed stands with thick lichen carpets because of the prevalence of fire. Northwards there is a progressive reduction in the tree cover on the summits of till ridges until the region adjacent to the Tundra is reached. Black spruce predominates both on coarse soils derived from shallow drift and on shallow peat deposits. White spruce is confined to eskers and bottomlands. To the north there are extensive deep deposits of peat with tundra vegetation and permafrost often as close to the surface as one foot. Secondary communities of shrubs, mainly willows and alder are common. Northwards tamarack is typical of well drained sites after fire and jack-pine thins out rapidly reaching its northern limit well short of the southern boundary of the Tundra zone.

The eastern portion of this zone coincides with the Hudson Bay Lowlands. Here there are extensive areas of recent alluvial and peaty soils and the nature and drainage of the soils exert a close control on the pattern of vegetation. Much of the interior is occupied by treeless bog and fen vegetation showing a diversity of patterns controlled by local slight relief and drainage. This area is treeless and the bogs are covered by sedge, shrub and moss vegetation types. Only along rivers, on raised beaches and on young, recently exposed glacio-fluvial material is there any continuous forest. Tamarack and white spruce occupy the youngest sites on mineral soils and black spruce is confined to older areas where peat has accumulated. The mineral material is of a calcareous nature and where there is no deep mantle of peat relatively rich communities of plants are common.

Arctic Tundra

On a strip of country along the shore of Hudson Bay extending from the mouth of the Nelson River northwestward into Keewatin territory, tundra vegetation predominates on moderately and well drained sites. On dry soils, sands, gravels, and coarse morainic soils it consists of low shrubs with lichens and occasional grasses forming a continuous heath mat. The main shrubs are crowberry (*Empetrum nigrum*), bearberry (*Arctostaphylos rubra and A. alpina*), northern Labrador tea (*Ledum decumbens*), rock cranberry (*Vaccinium vitis-idaea*), Alpine azalea (*Loiseleuria procumbens*) and Alpine bilberry (*Vaccinium uliginosum*). The conspicuous lichen element is made up chiefly of species of *Cladonia, Cetraria* and *Parmelia*. In areas of slightly impeded drainage, sedges (species of *Carex*) form a conspicuous part of the vegetation along with dwarf willows (*Salix arctophila, S. herbacea*) and a variety of northern herbs. Trees are very rare in this region and only tamarack, black spruce and white spruce are found, the last being confined to alluvial soils and eskers. In this tundra region there are local areas of well drained substrata with a predominantly grassy cover, the following species being common: *Hierochloe alpina, Agrostic borealis, Poa glauca,* and *Deschampsia atronpurpurea*. Poorly drained sites are dominated by sedge and cotton-grass (Eriophorum species) communities.

Swamps

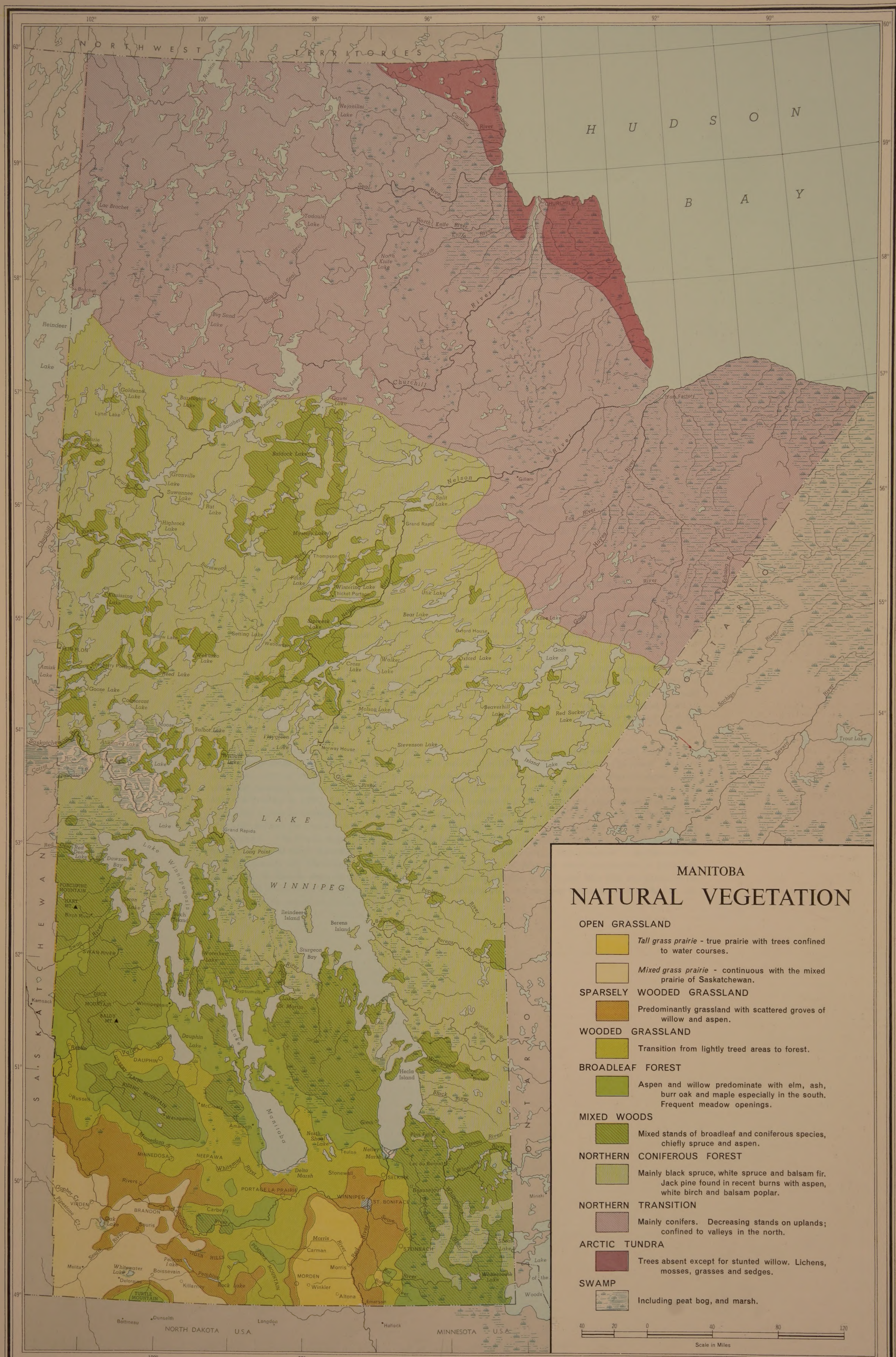
Areas referred to in general terms as swamps are widespread in the province, with the exception of the southwest portion. They occur either directly associated with lakes and river deltas or in places where drainage is excessively poor. Swamp vegetation is usually divided into two main categories: bogs and fens which develop on substrata made up primarily of organic matter (peat), and marshes which occur on primarily mineral soils, such as the extensive alluvial deposits at Netley, Delta and Summerberry near The Pas.

The most extensive continuous areas of bog and fen in the province are found on the Hudson Bay Lowlands where they have formed on the mantle of peat accumulated over the flat, poorly drained marine and glacial clays. They occur in depressions throughout the Canadian Shield region of the province. The vegetation varies from a black spruce cover with such small shrubs as Labrador tea (*Ledum*), bog rosemary (*Andromeda*), and dwarf cranberry (*Oxycoccus*), and a dense carpet of *Sphagnum* moss, through sparse larch stands to treeless heath and sedge types. Fens are found where the peat is less acid than in bogs and where mineral nutrients are present in the ground water. They have a richer flora, usually lack *Sphagnum* and often have dense shrub cover especially willows and dwarf birch.

Marshes are dominated by tall grasses, rushes and sedges, the commonest species being reed-grass (*Phragmites*), cat-tail (*Typha*), sprangle-top (*Scolochloa*) and bulrush (*Scirpus*). They are of importance as nesting and feeding grounds for wildfowl, and natural habitat of muskrats.

[1]The vegetation of the settled regions has been taken largely from the township descriptions of the land surveys made when the various districts were being opened up for settlement from 1871 to about 1921. Data for the forested zones, more particularly the Mixed Woods and the Northern Coniferous has been taken from the forest resources inventory completed in 1956. In this case the existing forest cover has been compiled by townships using the tree distribution shown by the forest inventory.

Reference: Province of Manitoba, Forest Resources Inventory 1956, Forest Service, Reports No. 1—7, 1959.



MANITOBA

NATURAL VEGETATION

OPEN GRASSLAND

Tall grass prairie - true prairie with trees confined to water courses.

Mixed grass prairie - continuous with the mixed prairie of Saskatchewan.

SPARSELY WOODED GRASSLAND

Predominantly grassland with scattered groves of willow and aspen.

WOODED GRASSLAND

Transition from lightly treed areas to forest.

BROADLEAF FOREST

Aspen and willow predominate with elm, ash, burr oak and maple especially in the south. Frequent meadow openings.

MIXED WOODS

Mixed stands of broadleaf and coniferous species, chiefly spruce and aspen.

NORTHERN CONIFEROUS FOREST

Mainly black spruce, white spruce and balsam fir. Jack pine found in recent burns with aspen, white birch and balsam poplar.

NORTHERN TRANSITION

Mainly conifers. Decreasing stands on uplands; confined to valleys in the north.

ARCTIC TUNDRA

Trees absent except for stunted willow. Lichens, mosses, grasses and sedges.

SWAMP

Including peat bog, and marsh.

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

PART TWO

Population and Settlement

"Man is both the most dynamic agent of production and the beneficiary of the entire process of resource development and utilization."

— E. W. Zimmermann

Although nature sets the stage, man is the actor. Physical resources have limited meaning in themselves; only as they are regarded in the light of human experience may we arrive at the full potentialities of a region. Human resources are not measured in numbers alone; the degree of technological achievement, the social organization and economic institutions are highly important elements in evaluating human resources. Thus, while there are many intangible elements involved in the concept of human resources, the purpose of Part Two is to examine those elements of population which lend themselves most readily to map analysis.

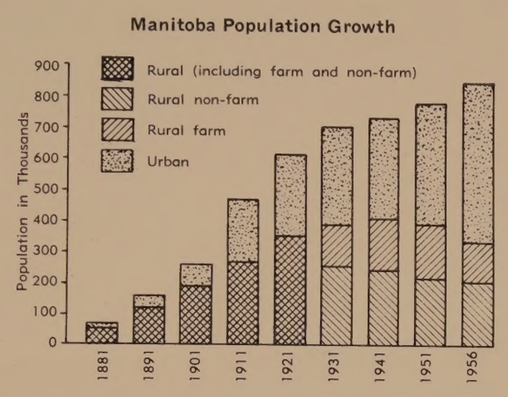
The fact that the average density of population per square mile in Manitoba is 3.5 is of minor importance; but that 94 percent of the people are found in the area which lies southwest of a line running from The Pas to southeast Manitoba is of great significance. Among the implications of this unequal distribution is the challenge of the Shield to more effective settlement and economic opportunity. Expansion of settlement into this region will take the form of planned communities based on resources of timber, minerals and recreation. The projected road development (plate 35) and power potential (plate 26) will change the map of settlement in the next decade.

Plate 11 shows rural population, not as defined by the Census to include all communities under 1,000, most of which are primarily urban in function; but by deleting all towns over 50 population, a truly rural pattern is presented. Plate 12 is the complement of plate 11 for it includes all urban communities above 50 persons. Moreover, these are shown in size categories revealing significant patterns of distribution. Plates 13 and 14 show the growth of settlement since Manitoba became a Province in 1870. Each decade indicates the general movements in both urban and rural settlement until 1921 when areal expansion virtually was complete. Homestead records were used in compiling the early maps. Recent trends (1941-56) indicate the strong rural to urban migration, almost entirely a movement from the farms to the larger towns (see text, page 52). The density maps (plate 15) show details based on the smallest statistical units used to compile Census data, namely, the 6-mile-square township. Total density includes both rural and urban, a map significant to market analysis, road requirements and educational facilities. The final plates (16-17) set forth the ethnic composition of Manitoba. No province in Canada shows the same degree of diversity. Cultural affinities with the past leave their impression on the landscape in varied forms and types of settlement and kinds of land use. No man can ignore the forces of the past who would explain the present or provide for the future.

RURAL POPULATION

Manitoba's Population Growth

In the period of 85 years from 1871 to 1956 Manitoba's population increased from 25,228 to 850,040. Normally there will be some natural increase (excess of births over deaths) in a well populated area, but whether there will be a total population increase is determined by the number of people who move into the area and the number who leave it. Until 1901 there was a movement of people into Manitoba, and the population grew rapidly to 255,211. From 1901 to 1906 the population catapulted to 365,688, a gain of 110,477, the largest quinquennial increase in the history of the province. Manitoba continued to grow faster than the nation as a whole until 1916, when 6.9 percent of the total population of Canada lived in Manitoba. The Census of 1921 marks an important point in the population growth of Manitoba because, from 1916 to 1921, the gain for the first time was actually less than the natural increase. Most of the agricultural lands of the province were occupied and people were finding other parts of the country more attractive and were leaving Manitoba. This process continued through the '30s and the '40s so that Manitoba grew only slowly in population, because the natural increase was very nearly nullified by emigration. But from 1951-1956 Manitoba was once again able to hold its natural increase as sufficient resources were developed within the province to support the population. The rate of increase has, however, remained below that of Canada as a whole. In 1956, 5.3 percent of the Canadian people lived in Manitoba.



Rural and Urban Trends

Manitoba's early economy was based primarily upon agriculture and consequently for many years the population was mainly rural. In the 1871 census 95 percent of the people in Manitoba were registered as rural, and in 1881 the rural inhabitants still comprised over 80 percent of the population. People who migrated to Manitoba settled both on homesteads and in trading towns, but the rural proportion of the population remained above 70 percent until 1901. After that year the majority of the settlers who came to western Canada sought out the farm lands west of Manitoba, and the rural growth failed to keep pace with the expansion of urban centres. As a result the proportion of rural people fell by 1911 to between 50 and 60 percent of the total population, where it remained until 1951. Both the rural and urban population experienced a slow and halting growth until 1941 so that the proportion between the two tended to remain the same. But since 1941 Manitoba has undergone a renewal of the rapid trend to urbanization that characterized the first decade of this century and in 1951 the rural population registered the first absolute decline in the history of Manitoba falling to just barely one half the total population of the province. Since then the trends of rural and urban population have continued to diverge in Manitoba, as farms become more mechanized and larger, as small trading centres are dominated by larger ones, and as the demand for labour in the increasingly industrialized cities continues. Accordingly the urban population of Manitoba has increased since 1951 whereas the rural population has continued to decline. In 1956 for the first time the rural proportion of the population was less than the urban, dropping to 40 percent of the total population.

Distribution

The approximately one third of a million rural people living in Manitoba in 1956[1] were very unevenly distributed, less than 12,000 living north of the 53rd parallel.

This map clearly shows that most rural people in Manitoba live in the southern third of the province where conditions are suited for agriculture. In the north, the short growing season and poor soils sharply restrict agriculture. As a result people in that part of Manitoba are clustered in places where there are opportunities for fishing and trapping. (Mining usually supports urban centres, shown on plate 12). These population clusters of the Shield are linked by waterways or strung along the Hudson Bay Railway, but do not form continuous settlements. By contrast there is a more continuous distribution of population in the agricultural areas. Even here there are great variations in density, dependent largely upon the suitability of the terrain for agriculture but also affected by the sequence of settlement, by the attitudes of different ethnic groups towards agriculture, and by the impact of local markets on agricultural production. Within southern Manitoba four types of areas can be distinguished according to distribution of population: (1) virtually empty, (2) densely settled, (3) a fairly uniform moderate density, and (4) narrow extensions of settlement into marginal areas.

Southern Manitoba

1. *Empty Areas:* Settlers have avoided areas that are poorly drained, have sandy or shallow soils, or consist of hummocky end moraines. Most of these lands have been placed in reserves of various kinds. In southeastern Manitoba large tracts of land are so poorly drained that they tend to be marshy, and elsewhere the land is so sandy and even rolling that it does not lend itself to highly productive agriculture (plate 5). Furthermore, the ice-scoured rocks of the Shield strike across southeastern Manitoba towards the Lake of the Woods and effectively rebuff agriculture. Hence, a large part of this section of the province is in forest reserves or designated for recreational use by the provincial government, and has hardly any permanent inhabitants. The reserved areas include the Agassiz, Sandilands, Belair, Whiteshell and Northwest Angle Forest Reserves.

The limestone strata of the Interlake area (especially when associated with poor drainage) can inhibit settlement as effectively as the knobby crystalline rocks of the Shield, and agricultural settlement stops sharply at Gypsumville. If the limestone is covered with till, agriculture is possible but the population still tends to be thin, since the people are dispersed on the higher, better-drained sections. North of Portage la Prairie and west of Lake Manitoba agriculture is also severely handicapped by poor drainage conditions. Since there are no important forests in the area none of the land has been reserved for forestry purposes.

In the southwestern part of the province drainage is not generally a problem but sandy surface materials and rough terrain present difficulties for agriculture. These areas have all been placed in reserves. The sand hills of the Assiniboine are in the Spruce Woods Forest Reserve south of Carberry, and the hummocky morainic country that forms the highest elevations in the province is included in the Turtle Mountain Forest Reserve on the International boundary, in Riding Mountain National Park and the Duck and Porcupine Mountain Forest Reserves farther north. Beyond the Red Deer River, settlement is curtailed by shallows soils and inadequate drainage.

2. *Densely Settled Areas:* The densest area of rural settlement in Manitoba is found in a few districts in the Red River plain where the land is farmed very intensively. Surrounding Winnipeg and continuing north for twenty miles are many market gardens, each relatively small, resulting in a dense rural population about the metropolis. The effects of the Winnipeg market have also influenced the region immediately to the southeast of the city, where many small farms are devoted to raising poultry and producing milk for the urban market. This densely inhabited region is occupied by French-Canadians whose forebears first settled along the banks of the Seine River over a century ago and by Mennonites, who arrived in 1874 and whose settlements are concentrated about Steinbach. Large families are common in both ethnic groups and both have also been inclined to maintain their roots in the soil. Since they lived on fertile land located close to an urban market, it has proved possible for these people to maintain a livelihood on rather small farms.

Along the western shore of Lake Winnipeg, where Icelanders first settled in 1875, there is a dense rural concentration that is only partially based upon agriculture. Besides mixed farming, fishing is important, and some of the inhabitants derive an income from the seasonal recreation industry based on the lovely Lake Winnipeg beaches. The lake front is important in the economy, so this is only a linear concentration with little depth. Another salient of dense population extends west of Winnipeg along the Assiniboine River to Portage la Prairie. French Canadians occupy the land about St. Francois Xavier, and Hutterites have moved into a district south of the Assiniboine. This is one of the oldest mixed farming areas in Manitoba. Close to Portage la Prairie some specialty crops are grown, and there is an Indian Reserve west of the city.

There is another large compact cluster of Mennonite farmers in the Pembina triangle southwest of Winnipeg. These farmers have always been reluctant to allow their children to leave the land, and ever since the 1880's this has been one of the most densely populated rural areas in western Canada. Fortunately the Pembina triangle is favoured with physical conditions for farming that are unique within Manitoba, so that it has proved possible in recent years to diversify and intensify farm operations. Sunflowers, vegetables and sugar beets are grown for processing in Manitoba factories, and some farmers are actually making a living from farms that are under 40 acres in size. This dense area of settlement continues east of the Mennonite district to a closely settled French-Canadian area at St. Jean and Letellier. Northwest of Morris there is another concentration of Mennonites but here the dense population consists of wheat farmers together with a unique agglomeration of rural craftsmen who operate small manufacturing shops in the area.

There are some other dense clusters of rural settlement that are not located on the Red River plain. By contrast with the concentrations in the lowland, each occupies only a relatively small area. At Swan Lake (west of Carman) and at Oak River (between Brandon and Virden) there are densely settled Indian Reserves. In the districts about Brandon, Virden and Dauphin there are dense populations. These are partly the result of the smaller farms in the districts but of greater importance is the spread of settlement beyond the periphery of each urban centre.

3. *Areas of Uniform Moderate Density:* Southwestern Manitoba has a fairly uniform distribution of population of rather low density. This area was settled mainly by Ontario Canadians experienced in mixed farming; but they proved to be adaptable, and on the level terrain of Manitoba, with constantly improving varieties of grain and machinery at their disposal, they became specialized grain farmers. It was possible to operate ever larger acreages with less labour, and as farm size increased, a pronounced migration from the farms began which has continued to the present. There is some variation in density of population reflecting local conditions.

Between Carman and Winnipeg there are large grain farms and a low population because settlement was impossible in the area until large scale drainage works were undertaken at the turn of the century (plate 25). Much of the land had been held in large blocks by speculators and after the land was drained, they turned their properties into large wheat farms, many of which are still in existence. Upland Manitoba south of the Assiniboine is the grain farming area *par excellence* of Manitoba and is rather sparsely populated. Westward the population continues to thin out appreciably as the farm size increases. This area receives only moderate precipitation and large scale grain-farm operations are thus imperative. Grazing districts such as Oak Lake have low population densities of the sort that prevail in the dryer areas of southern Saskatchewan.

North of the Assiniboine farming becomes more diversified and the mixed farms smaller, so that there is a denser rural population than in the grain areas immediately to the south. The area from Gladstone through Birtle to Russell was originally settled by Ontario Canadians and by colonists from Great Britain who delighted in the partially wooded rolling countryside and established the kind of farms that they had known at home. These farmers have not made the complete switch to grain farming that characterizes the southwest. The more broken country adjacent to Riding Mountain was occupied by Ukrainians and Scandinavians who have developed rather small mixed farms in this park countryside with a corresponding slightly higher density of population.

The fairly high densities found immediately south of Riding Mountain flank both sides of the unpopulated mountain and meet again in the area extending from Roblin to Dauphin. On the west flank the mixed farming belt follows the beautiful and impressive Assiniboine River, a distinctive region within Manitoba, originally settled by English people but now also occupied by other groups, particularly Germans and Ukrainians. Large scale livestock-raising characterizes parts of the Upper Assiniboine south of Russell, accounting for the lower population density in that area. Along the eastern piedmont of Riding Mountain there is a narrow belt of fairly dense settlement on some fertile soils derived from alluvium carried down from the mountain. There is a pronounced eastward salient of dense settlement towards the French-Canadian area at Ste. Rose du Lac, where the farmers are largely dependent upon livestock. In the valley between Riding and Duck Mountains is another fairly closely settled mixed farming area. This region was occupied by settlers of British descent in the decade after 1890, but later many Ukrainians moved to the slopes of the mountains on either side of the valley and into the country north of Roblin.

East of the valley, agricultural settlement extends to Lake Dauphin and along the Mossey River to Winnipegosis. There is even a scattered population east of Lake Dauphin from Winnipegosis towards Ste. Rose du Lac. The land here is exceedingly variable and all the farmers are dependent upon livestock, although fishing becomes important at Winnipegosis.

North of this area there is another piedmont settlement east of Duck Mountain, but the land is not nearly so well adapted to farming as that below the Pembina and Riding Mountains so that the settlement is fairly sparse, consisting only of a thin line of farms extending to the Swan River Valley. This is one of the great Ukrainian concentrations of the province. Between Duck and Porcupine Mountains lies the fertile Swan River Valley. It is the northernmost large, compact farming settlement in the province, with the exception of the new Pasquia development. It is a closely settled prosperous mixed farming area inhabited by agriculturists of many ethnic groups.

4. *Extensions of settlement:* Projecting from the more continuously settled southern part of the province are some ribbons of denser settlement thrust into areas that are marginal for agriculture. These are the most distant extensions of settlement still directly attached to the main body of the population, and they are found all along the edge of settlement from southeastern Manitoba to the Swan River Valley.

In southeastern Manitoba the Forest Reserves sharply terminate the eastward extent of the very dense Mennonite and French-Canadian settlements, but there are extensions of settlement into land which is not reserved. Paralleling the United States boundary is a straggling line of settlement on rather light-textured soils. Mixed farming and even subsistence farming combined with some pulp wood cutting supports the Ukrainians, French-Canadians and the few Scandinavians who live in this area. To the north there is a belt of settlement along the Whitemouth and Lower Winnipeg Rivers. Livestock farming is highly developed on the alluvial soils on either side of the Whitemouth River. Ukrainians and Germans have made their homes here since the early 1900's. Along the Winnipeg River mixed farming gives way before the Shield, but the rural population is augmented by the woods workers dependent upon the pulp and paper industry at Pine Falls.

Between Lakes Winnipeg and Manitoba the rural population is generally sparse but there are denser belts of settlement along the shores of both lakes and in the more favourable zone in the centre. Indeed, the shore of Lake Winnipeg ranks with the most densely settled areas in the province. An arc of Ukrainian settlement, based on livestock-raising, extends westward from it and joins the Indian settlements that follow Fisher River to Lake Winnipeg. The settlements along the shore of Lake Manitoba to Lake St. Martin are based on livestock-raising, dairying and fishing. French-Canadians live on the southeastern shore of Lake Manitoba and people of Scandinavian, British and German origin carry the line of settlement to the Indian Reserves at Lake St. Martin.

Along the western shore of Lake Manitoba and Lake Winnipegosis, and on Waterhen Lake there are only clusters of settlement. In these districts there is only a poorly developed livestock economy which is occasionally supplemented by fishing. The population consists of British, Ukrainians, Indians and other groups. The concentrations associated with Indian Reserves are at Amaranth, Manitoba Narrows, Waterhen Lake and Camperville. North of Swan River is another ribbon of agricultural settlement following the fairly well drained soils east of Porcupine Mountain. Many of the residents moved into this area as participants in a post-World War II settlement scheme.

Most of these sparse extensions of settlement have few people, not because they have been recently established (many have been occupied for a long time) but because they are located in areas of lasting difficulty, and generally only settlers who love the locality or feel no urge to move elsewhere have remained. Beyond these penetrations into the marginal areas lie pockets of settlement which represent a leap to a frontier where there are resources other than agricultural land; and they are virtually exotic oases amidst a formidable environment.

Northern Clusters

The northern centres of rural population represent the relicts of a different historical epoch than that with which the agricultural occupation of the province is associated. Most of these clusters are the sites of Indian Reserves but others represent settlements founded during the time of the great fur trading era. There are six Indian Reserves along the eastern Precambrian shore of Lake Winnipeg (with another one on Berens River close to the Ontario boundary) but along the western limestone shores of the lake there are only three. On many of the lakes farther north there are concentrations of Indians situated where they can make a livelihood by fishing and trapping and by working as labourers (plate 16). It is clear from the map that the settlements (with the exception of the one at Reindeer Lake) are all on communication routes that lead between Hudson Bay and the interior. At Churchill there are a number of Eskimos as well as Indians. There is little chance that these rural settlements will multiply greatly except for the Indian Reserves. As communications improve in the north, however, one can expect that the recreation industry will support a greater population in the region.

[1]The rural population of Manitoba according to the 1956 census was 339,457. According to the census definition, rural population comprises all persons residing outside cities, towns and villages of 1,000 and over. This map is more detailed, and all places of over 50 persons in 1956 have been deleted, but they are shown on plate 12.

MANITOBA

RURAL POPULATION

• One dot represents twenty-five (25) people

Exclusive of all urban settlements of 50 people and over, but including populations of Indian reserves and rural settlements along the Hudson Bay Railroad.

all towns of 1000 population and more ●
towns under 1000 •

Parks and Forest Reserve

DBS Census 1956.

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

URBAN SETTLEMENT

For a Gazetteer of urban centres with populations see page 81.

Most of Manitoba's 510,583 (1956) urban people live in the southern part of the province, 80 percent of them in Greater Winnipeg. The rest of the southern urban people live in a large number of fairly evenly distributed small centres. All of these are trading centres primarily serving the needs of an agricultural population. It is apparent from the map that the agricultural areas are well supplied with trading centres. In northern Manitoba there are only a few widely separated urban centres located at mineral deposits or at break points in transportation.

As in any large area, there is a great variation in the size of the central places of Manitoba. The number of places in the different size groups show a definite pyramidal arrangement, with many small centres at the base and one large centre at the apex. This arrangement suggests that there is a relationship between the type of services demanded by farmers and the size of the centres supplying these services. For his day to day needs the farmer will go to the most accessible centre, typically a hamlet or village with a limited number of services. There are many of these places scattered through the province. For more varied services not so frequently in demand, the farmer will have to go to larger centres with a wider range of facilities. Since these facilities normally require a larger population to support them they are located farther apart and draw customers from a tributary area that includes several hamlets and villages. Thus a hierarchy of service centres exists, offering fuller services to increasingly larger tributary areas at each level and culminating in the largest centre in the province, which provides specialized services for the entire area. This pattern of central places was in existence by 1900 and, though there are continual readjustments, its major lineaments have remained remarkably stable since then.

Greater Winnipeg's growth and present role in Manitoba and western Canada are discussed on pages 76 and 78. Here it is enough to say that it is the leading city of one of the great geographic regions of Canada. Its metropolitan influence penetrates to all parts of the province and far beyond. Besides being the political, educational, medical and cultural capital of Manitoba it is an important transportation, commercial, administrative and industrial centre for all of western Canada.

It has been impossible for any other centre to grow to a large size within Manitoba because of the dominance of Winnipeg. Brandon, a small yet well equipped regional centre serves the prosperous farming area of southwestern Manitoba. With a population of 24,796 (1/20 that of Greater Winnipeg) Brandon is alone at its level in the hierarchy of the province's central places. Since its establishment in 1881 on the main line of the C.P.R., it was destined to be the farm and administrative centre of the western part of the province. It fulfills that function admirably, because few cities of its size have comparable advantages. It has the solid, finished, comfortable appearance of a place that has exactly the necessary facilities and size to perform its regional functions. It is a transportation and wholesale centre and provides specialized services in a wide range of activities including banking and finance and retail trade. Within Brandon are a number of factories processing farm products and manufacturing farmers' supplies. Adding to its regional importance are a wide range of public service offices both provincial and federal, a Dominion Government Experimental Farm and Brandon College, affiliated with the University of Manitoba. Its diversified communication facilities, including a daily newspaper and radio and television stations, enable it to keep in close contact with its hinterland.

No other regional centre in Manitoba offers the same comprehensive services over so large an area as Brandon. However, along the densely settled line of the Escarpment (plate 15) there are three centres (Swan River, 2,644; Dauphin, 6,190; and Portage la Prairie, 10,525) that perform somewhat similar functions for small regions, and there is a similar centre in southeastern Manitoba (Steinbach, 2,688). They are not wholesale centres, with the partial exception of Dauphin, but farmers' towns offering a wide range of services. They are also administrative centres selected as convenient places from which to provide public services to a region. These places (along with Winnipeg and Brandon) comprise the main regional centres of southern Manitoba. Adjustments may occur and other towns may attain their rank. Neepawa could rank as a regional centre if Brandon did not cut off its hinterland to the west and Portage la Prairie to the east. There might have been a regional centre in the Pembina Triangle, too, if the urban population were not divided between Winkler and Morden. There is a possibility that other regional centres may develop in northeastern Manitoba and in the Interlake country.

Portage la Prairie was the western limit of settlement of the Red River colony and when settlers rushed to Manitoba after 1870, it immediately became the centre of what was perhaps Manitoba's best known farming area, the Portage Plains. It has prospered as the centre of this farming district, and despite the fact that it is only 50 miles from Winnipeg its population is over 10,000. Besides the productive agricultural hinterland some small industries including a brick yard, the railways, and some nearby Air Force Stations support this population. Dauphin and Swan River both serve fertile agricultural areas along the Manitoba Escarpment. They were founded at the turn of the century when the railway opened up the farm land north of Riding Mountain. Each owes its location to the fact that it controls an easy passageway through a productive valley penetrating the Escarpment. Dauphin is an important administrative centre and distributing point for the region lying north of Riding Mountain and between Lake Manitoba and the Saskatchewan boundary. It is also a railway divisional point and has some plants for processing farm produce. Its weekly newspaper and radio station are important factors in making it an effective regional centre. Swan River serves a smaller area between Duck and Riding Mountains. It is the regional centre at the northern limit of continuous agricultural settlement in the province and owes its importance to the fact that it is the only large town in the region. Steinbach has benefited from a similar isolated position in the southeastern part of the province, where it has emerged since 1945 as the regional centre. It was not accidental that Steinbach became the centre. Its businessmen actively sought to make it so and were greatly assisted by the local newspaper which now serves the region. Steinbach is not only a trading town for southeastern Manitoba but its aggressive tradesmen sell merchandise in a far wider area. It also has factories producing wood products and workmen's clothing.

Brandon, with a population of 25,000, is the commercial, industrial and distribution centre for the western portion of Manitoba.

Close to Winnipeg there are two large places but they are not primarily regional centres. Transcona, seven miles east of St. Boniface, is an industrial town chiefly dependent upon large C.N.R. railway shops. In recent years other industries making iron and steel products have been established there, and its industrial base is now more diversified (plate 34). Selkirk, 20 miles north of Winnipeg, serves as a trading town for the farmers in the adjacent area, but it is of greater importance as an industrial centre sustaining Manitoba's only iron and steel mill. It is also an important centre of the Lake Winnipeg fishing industry, with its fish filleting plant and boat building industry. Moreover it is the main southern terminus of the boats plying Lake Winnipeg and many of the goods destined for northern Manitoba are trans-shipped here.

Within the framework of regional centres are the many trading places that supply fairly comprehensive services to the farmers in their hinterlands but which are not so significant from a broad regional point of view. The facilities required by the farmers are a grain elevator, general store, implement shop, garage, hardware store, lumber yard and bank. The school, church, and municipal office are important, and the small town usually serves as the recreational centre. It may or may not have a theatre but it does have a curling and skating rink, and a baseball field. The hamlets, of course, perform only a few business functions for the farmers and may consist simply of a general store, so that for the majority of their needs the farmers go to the nearest larger centre. As well as the basic services the larger towns probably possess drug stores, tailor shops, electrical appliance shops, beauty salons, as well as the offices of doctors and lawyers and probably a hospital.

In eastern Manitoba, where Steinbach is the dominant centre, there is an irregular distribution of trading centres because much of the area is not suited to agriculture. In the southeastern area there are a few hamlets situated along the railway where section workers or pulp wood cutters live. Along the United States boundary and closer to the Red River where agricultural conditions improve, the trading centres are more regularly spaced along the railways.

North and east of Winnipeg there are no regional centres. Close to the Ontario border there are a few hamlets on the railway. On the lower Winnipeg River are two larger centres: Lac du Bonnet, a seaplane base and centre for forestry operations, and Pine Falls, a company town for the employees of a pulp and paper mill. Whitemouth serves the farmers living on the long lots on either side of the river of that name. Closer to Red River the farmer trading towns become more common. Beausejour, a large town east of the Red, is balanced by the well-established Stonewall on the west. Beausejour is a rapidly growing town in an area where there are no rival centres, so that its trading hinterland is expanding to the northeast.

Extending northwards into the Interlake country are four railway lines, each with its complement of trading centres. Gimli, on Lake Winnipeg, preceded the railways and is a famous Icelandic centre. It is well known as a fishing town and there are some fish processing plants situated there. The nearby R.C.A.F. station has aided the development of the town. In the Interlake area Arborg, Eriksdale, Teulon and St. Laurent are the most significant places. The first three are agricultural trading towns, but St. Laurent is a Metis long-lot settlement along the shore of Lake Manitoba. Gypsumville in the north is partially supported by the quarrying operations in the area.

West of the Red River the towns and villages are all located on the railways radiating out from Winnipeg. Before the railways were built a few centres had been established on the main trails, but they were quickly abandoned, or were moved to the railway if it by-passed them. Hence there are successive rows of towns along each of the east-west lines that lie between the United States boundary and Riding Mountain. This alignment is most evident on the Manitoba upland.

Altona, Winkler and Morden have grown impressively in recent years, partly because of the establishment of plants which process special crops. Altona has a vegetable oils plant and Winkler and Morden both have vegetable canneries. The latter also is the site of a Dominion Experimental Station. None of these towns is sufficiently important to be considered a regional centre, though Altona in 1957 added a radio station which should increase its regional influence. Carman, Morris and Emerson are old, substantial towns serving productive farming areas.

The trading centres paralleling the United States boundary date from the 1880's. Along the Morden to Melita railway line Manitou, Pilot Mound, Killarney, Boissevain, Deloraine and Melita are between 15 and 30 miles apart, with villages located at shorter regular intervals between them. That the larger centres require hinterlands of about 8 to 15 miles radius seems supported by the fact that there is only one incorporated centre, and no place over 700 population, on the parallel east-west railway line approximately 10 miles to the north. Only Ninette, where a large sanatorium is located in the beautiful Lang's Valley, and Hartney, a railway junction to the west, have over 500 people. This line was not completed until 1900, by which time the railways to the south and north had been operating for some years, enabling the trading centres located on them to gain a head start. Again, however, there are an ample number of smaller trading towns on this line serving the farmers in this area.

The places on the third railway north of the boundary, extending from Elm Creek to Souris and Pipestone, are not so large, east of Wawanesa, as those directly to the south on the Morden to Melita line. This is probably due to the unproductive land along the Assiniboine immediately to the north, limiting the supporting population. From Elm Creek to Souris the centres vary in size from 400 to 800 people with no outstanding one emerging, though Glenboro has over 700 people. Souris, however, has a population of over 1,500 though it is only 20 miles from Brandon. In the centre of a fertile district and at the junction of two railway lines, it is an important trading town.

Along the C.P.R. main line are the usual closely-spaced centres, the larger ones being MacGregor, Carberry, Virden and Elkhorn. Virden, 46 miles west of Brandon, has been growing rapidly in recent years as the operational centre of the Manitoba oil field, but even before that it was a substantial trading town in the western part of the province. Its increased services developed to serve the oil workers are of real benefit to its large tributary area.

Neepawa, (over 3,000 people) is an important distributing centre in the area between Brandon and Portage la Prairie. It is a railway divisional point and a manufacturing town, possessing Manitoba's only salt processing plant. Minnedosa has a large productive hinterland and is also a recreational centre. Rivers is an important trading town between Minnedosa and Brandon, and gains some support from a nearby air station. Hamiota, Shoal Lake, Birtle and Russell are fair-sized towns serving the area between Minnedosa and the Saskatchewan boundary.

Three railway lines head northwards between Riding Mountain and Lake Manitoba, but only one extends beyond McCreary. McCreary, half way between Neepawa and Dauphin, and Ste. Rose du Lac, a French-Canadian centre, are the largest villages. Roblin is at the head of the pass controlled by Dauphin. It is an important trading town at the western margin of the province where lumbering is of considerable importance. Grandview and Gilbert Plains serve rich farming areas between Roblin and Dauphin.

North of Dauphin there are a number of Ukrainian centres of which Ethelbert is the largest. Winnipegosis is an important fishing centre. In the Swan River Valley and on the agricultural lands at the base of the Porcupine Mountain are more small centres, within the region served by Swan River. Minitonas, Bowsman, and Birch River are the most significant. Lumbering is important in this region and helps support some of the villages.

In northern Manitoba there are a number of large centres particularly at large ore deposits. These towns are not as stable as the farming centres, because when the ore is exhausted the one basic support will be gone. Flin Flon, however, has been established since the 1920's and is now the fourth largest city in the province. It is dependent upon the base metal mines on which it is located but it has also become an important distributing centre for northern Manitoba. Lynn Lake is a nickel mining centre, Bissett is based on gold and Thompson is the newly established town at the Moak Lake nickel deposits. It can be expected that other centres will spring up as more mines are developed in the Precambrian rocks of Manitoba.

There are some central places in the north that are related to transportation. Norway House at the northern end of Lake Winnipeg is a supply point for north central Manitoba, with many goods brought in by boat in summer and trans-shipped there. The Pas on the Saskatchewan River owes its importance as a distributing centre to the Hudson Bay Railway. It is also a trading town for the developing Pasquia farming settlement. Along the Hudson Bay line to Churchill there are a number of minor stopping places, but Churchill itself is a notable centre. Besides having extensive military installations, it is an important ocean grain shipping port and an air base for arctic Canada.

MANITOBA

URBAN SETTLEMENT and POPULATION

Including all hamlets, towns and cities both incorporated and unincorporated of 50 people and over

Population categories indicated by differences in type style and symbols.

URBAN CENTRE	POPULATION RANGE [1]
Birds Hill	50 — 200
Whitemouth	200 — 500
Somerset	500 — 1000
Boissevain	1000 — 2000
MINNEDOSA	2000 — 5000
DAUPHIN	5000 — 10000
BRANDON	10000 — 25000
WINNIPEG *(metropolitan area)*	427,536 *(1958)*

[1] *DBS Census 1956.*

Scale in Miles: 40 20 0 40 80 120

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

SETTLEMENT 1870-1921

The first settlements established in the area now included in Manitoba were associated with the fur trade (plate 14). Because of the focal character of the region the routes leading from Hudson Bay and the Great Lakes to the interior of the continent passed through it. Accordingly, trading posts were built by both the Hudson's Bay and the North West Fur Companies within this area. The posts were at widely scattered points commanding strategic locations for carrying on the fur trade. They ranged from the transfer point at York Factory on the barrens of Hudson Bay to the collecting points on the Red and Assiniboine Rivers in the potentially fertile Red River lowland; and from The Pas on the Saskatchewan River, the gateway to the Far Northwest, to Fort Alexander on the Winnipeg River, on the route to Lake of the Woods, Fort William and finally Montreal. But no great population growth could be expected from the fur trade since dense settlement and the fur trade were mutually exclusive.

Yet in 1812 Lord Selkirk attempted the seemingly impossible task of associating agriculture with the fur trade. At the junction of the Red and the Assiniboine he founded a virtually isolated agricultural settlement with the intention that the colony would supply provisions to the Hudson's Bay Company's fur brigades. Almost 200 settlers from Scotland and Ireland were brought to Red River in the first three years of settlement. They were beset with formidable difficulties, but by 1822, augmented by retired Swiss soldiers, Metis and retired fur traders, the Colony numbered 1,281 people. By 1870, the year the Colony became part of Canada and the Province of Manitoba was created, the population had grown to 12,288.[1]

For many years the main means of communication with the outside world was via Hudson Bay, an arduous route that involved dangerous rivers and a lengthy voyage. But in the 1850's the famous Red River carts came into use for conveying freight. An important trail connected Fort Garry with St. Paul, and in 1859 this southern route was greatly improved when the first steam boat on the Red, the Anson Northrop, was placed in operation.

The single trading centre in 1870 was Winnipeg, a small village of about 100 inhabitants that had begun to take shape in the 1860's about half a mile north of the junction of the Red and the Assiniboine. Most of the people lived in the parishes that extended along the Red and Assiniboine Rivers, though there were a few small outlying settlements. The farms were laid out along the rivers in long lots, patterned after the rural settlements of Quebec, producing an elongated form of settlement.

1870 - 1881

The sectional survey was first started systematically in 1871 and the Dominion Lands Act of 1872 made homesteads available to settlers. These events signalled the end of the fur trade era in the west and the opening of settlement on an agricultural basis. But only a disappointingly small number of immigrants were attracted to Manitoba and in 1881 there were less than 63,000 people in the province. Most potential settlers were well aware that there was still ample vacant land available in the United States and that communications with the outside world from Manitoba were difficult and slow.

Until 1878 immigrants had two ways of coming to Manitoba; neither of them was easy. They could enter Manitoba via the United States going by railway to Moorhead, Minnesota on the Red River, and then completing the journey by Red River steamer. The alternative was the much more difficult, but all Canadian, Dawson route via the Great Lakes. A combination of trails, steam launches and portages carried immigrants from Lake Superior to the western shore of the Lake of the Woods, where the journey was completed to Red River by the Dawson Trail. This route had been reconnoitered in 1859 but it was not used by immigrants until 1871. When the railway from Emerson to St. Boniface was completed in 1878 Manitoba was finally linked to the American railway network and a very serious deterrent to settlement was overcome.

After 1870 the settlers no longer stopped at the flood plains of the rivers but went farther afield into the prairies and park lands. But settlements were not evenly distributed over the countryside. A considerable number of Ontario settlers, who comprised the greatest single group of immigrants in these years, occupied the park lands beyond the river lots on either side of the lower Red, particularly in the Stonewall area. But more continued westward, carefully seeking out the well drained park areas of the Pembina Mountains and those west of Portage la Prairie along the Saskatchewan Trail. There were a few scattered settlements in the southwestern part of Manitoba along the Boundary Commission Trail, and a few pioneers even ventured across Riding Mountain into the fertile valley between the Riding and Duck Mountains. Since the C.P.R. was completed only to Brandon in 1881, most of these settlements preceded the railway and the farmers were dependent on trails.

Even more concentrated settlements than those produced by the Ontario settlers' careful selection of well drained and wooded land, resulted from the practice of granting reservations to various ethnic groups for their exclusive use. Tracts of land were reserved for the Metis and the French-Canadians and also for two new ethnic groups from overseas, the first of many that were to come to the prairies: the Mennonites and Icelanders. Most of the Metis and French-Canadian reservations were in lowland Manitoba not far from the Red and the Assiniboine Rivers, although one French Reserve was established northwest of Nelsonville in the upland. Both the Mennonites and Icelanders were given land in lowland Manitoba. Approximately 7,000 Mennonites migrated to Manitoba from Russia between 1874 and 1880. They settled on the marginal land south of the French-Canadian settlements on the Seine River with Steinbach as their main centre, and on the open prairie between Emerson and Nelsonville, where they demonstrated that it was feasible to settle on land where trees and water were not right at hand. The Icelanders were assigned land on the western shore of Lake Winnipeg, extending north and somewhat south of their main settlement at Gimli. About 1,500 immigrants settled in this difficult area in 1875 and 1876.

The transportation system serving these scattered and thinly populated settlements was still rudimentary in 1881. The railway from East Selkirk to Port Arthur was not completed until 1883, so that all traffic in and out of Manitoba went via American railways through the port of entry at Emerson. Winnipeg was the largest centre in the province but its dominance was challenged by both Emerson and Selkirk, which hoped that their railway connections would enable them to rival Winnipeg.

1881 - 1891

Many miles of railways were built in this decade in an effort to catch up with the rapidly advancing settlements. The C.P.R.'s main line to eastern Canada was completed in 1885, and three new east-west lines were built south of the main C.P.R. line. Many farmers, still mostly from Ontario, quickly moved into the southwestern and south central parts of the province, so that the best arable lands were practically all occupied by 1891.

Though the frontier of settlement had already moved west beyond Manitoba into the Northwest Territories, there still remained some districts of empty land in the southern part of the province. The largest empty area was in the southeast, where poor soils and poor drainage effectively kept out settlers. Other significant scantily settled districts were the rougher lands along the Escarpment, the sandier districts along the middle Assiniboine where agriculture was impossible, and the potentially fertile but very wet lands between Morris and Carman.

Farmers were also gradually pushing northwards. The railway northwest of Portage la Prairie through Minnedosa and Birtle brought many new settlers to the beautiful Riding Mountain park country, though the steeper slopes were not occupied as yet. Expansion into the fringe areas beyond the railways was also continuing right across the northern frontier of settlement and many adventuresome settlers, usually of British origin moved into the Interlake area near Lake Manitoba, occupied the lands northwest of Gladstone and pushed into the Dauphin district.

The pattern of trading centres as it exists today in southern Manitoba was beginning to take form in this decade. Winnipeg was securely established as the dominant centre but smaller places such as Portage la Prairie, Brandon, Neepawa, Virden and Russell were also important. In this decade the population increased by 90,246 people to 152,506. Southern Manitoba had become a moderately well settled farming area.

1891 - 1901

In this decade two very important main railway lines were built which opened up new territories on the fringes of the settled districts. One line, from Gladstone through Dauphin to Swan River and beyond, brought railway service during the years from 1897 to 1899 to the settlers who since 1881 had been living in the park lands north of Riding Mountain. The other railway line from Winnipeg to Fort Frances (started in 1898 and completed in 1900) passed through the forested lands of southeastern Manitoba that were really too poorly drained and too sandy for agricultural purposes.

Settlers of British stock immediately occupied the best lands in both the Dauphin and the Swan River areas. Many of them had been farming in southern Manitoba and sold their original improved homesteads at high prices to start again on a larger scale in this new farming country. These were the last of the best agricultural lands of Manitoba, and their occupation left untouched only the marginal lands which demanded much more work and gave fewer returns than any of the lands hitherto settled. These lands, extending in an arc from the southeastern part of the province through the Interlake country past the Dauphin and the Swan River areas to the Saskatchewan boundary, had been considered undesirable by earlier immigrants. The major part of the task of carving farms out of the "bush country" was assumed by Slavic people who came to Manitoba just when the last of the good land was being occupied. The first Ukrainians arrived in 1896 but the push into the marginal lands did not begin until 1901.

As a result of the opening up of the northern areas, the beginning of settlement of the marginal lands and a marked increase in population density in the southern uplands, the population of Manitoba increased to 255,211 in this decade.

1901 - 1911

The initial occupation of most of the agricultural areas of Manitoba was almost completed by 1901. During this decade there was a great migration of European and American immigrants to western Canada. Most of them by-passed Manitoba and settled on the relatively empty tracts of the western prairies. Yet enough of these people settled on the vacant lands of Manitoba to make it the greatest influx in the province's history. The population rose to 461,394 in 1911.

In this decade many prosperous settlers bought lands that had been left vacant as long as homesteads were available, adding in particular to the population density of upland Manitoba. Large scale drainage projects in the Red River lowland also made it possible to occupy some of the rich soils northwest of Morris and south of Portage la Prairie. But Ukrainian immigration continuing in a steady stream contributed particularly to the great increase of population. The Ukrainians reinforced all the settlements that they had begun in the northern fringe and along the flanks of the Riding and Duck Mountains.

Railway lines were built to serve the new mixed farming areas on the fringes of the older settlements. Elsewhere in the province grain farming reigned supreme and a denser network of railroads emerged in practically every grain growing area as the rival railway companies multiplied their lines. With the completion of these lines most farmers were within ten miles of a railway.

There was an increase in population density throughout almost the entire province but this was the first decade to show also a decrease in population within any significant area in Manitoba. In the most densely settled area southeast of Morden many Mennonite farmers left their crowded lands to move further west and homestead again in Saskatchewan and Alberta.

1911 - 1921

There were few changes during this decade in the population density of the southern, well-settled portion of the province. The railway network was well developed in this area and few branch lines were added. The only considerable extension of population was in the pioneer fringe and this advance was supported by the building of a few new railway lines. The Greater Winnipeg Water Works Railway to Shoal Lake helped those who had settled on the alluvial soils along the Whitemouth River. Important lines were also built in the Interlake country and along the western shore of Lake Manitoba to serve livestock raising areas. Farmers even attempted to move well beyond the railway into the relatively poor lands between Lakes Dauphin and Manitoba, thus broaching the last of the potential agricultural area of southern Manitoba.

These pioneer fringe areas provided a severe challenge to their inhabitants. They had such a difficult task making a livelihood that there was no incentive to expand the area of settlement any farther to the north. Many of the farms were so poor that little surplus was produced for sale and the farmer often had to supplement his income by working in the woods in winter or by fishing.

A comparison of this map with plate 15 shows that the agricultural limits of settlement in southern Manitoba were finally reached by 1921, a task accomplished in fifty years from the time the province was created. In certain areas the settlements had been over-extended by 1921 and in subsequent years there was a gradual retreat from some of the poorest lands. A comparison of the 1921 map and plate 15 shows that this was most pronounced in the area west of Lake Manitoba.

During these first fifty years the settlement of the province was accomplished almost solely by the efforts of individual farmers, and even the exploitation of other natural resources such as fishing and forestry was often complementary to farming. Further advances in settlement in Manitoba, such as those associated with the mining ventures of the north, were not possible without large scale investment. The day of the agricultural pioneer was over.

[1]Later census volumes give the population of Manitoba as 25,288 for 1871, but this includes an estimated 13,000 Indians.

More than half of Manitoba's population is concentrated in metropolitan Winnipeg. Population of this urban centre increased 31% during the period 1951 to 1959.

A

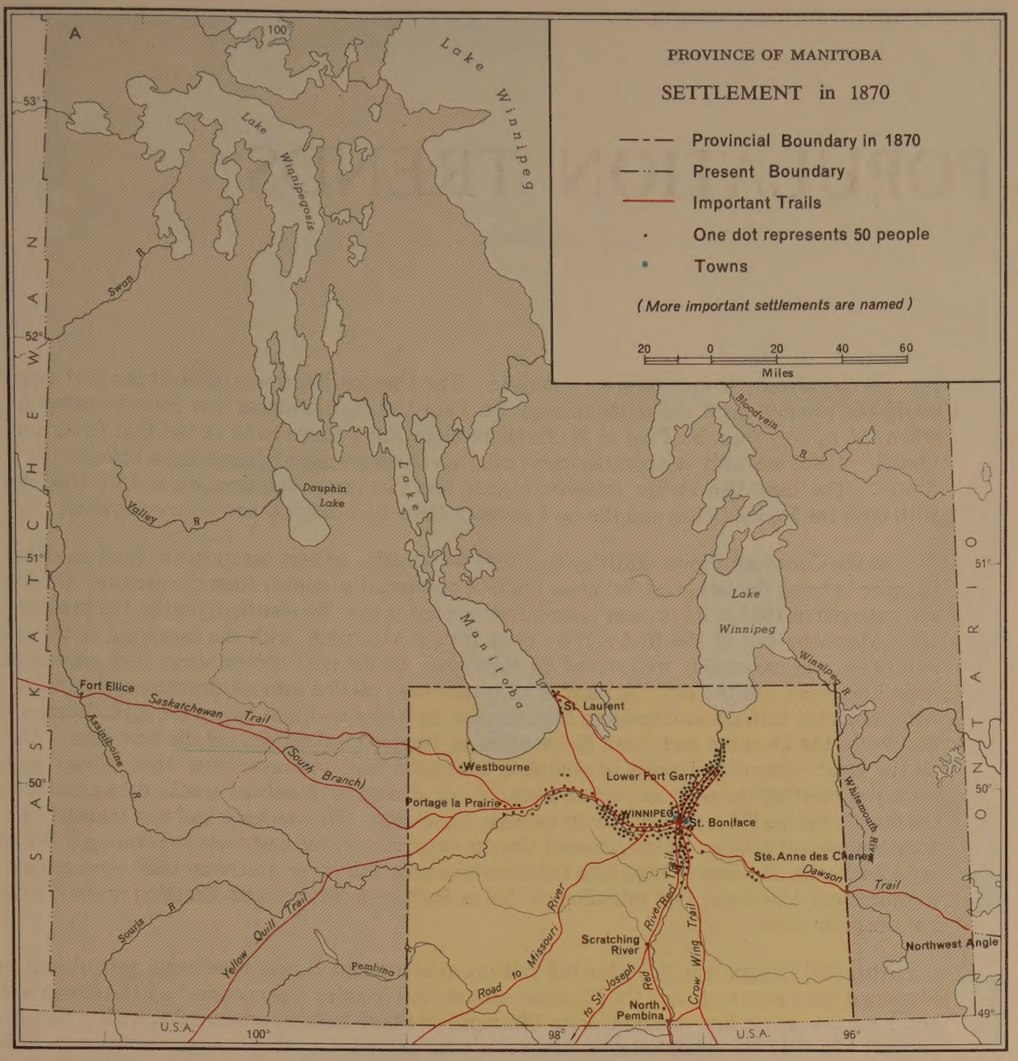
PROVINCE OF MANITOBA

SETTLEMENT in 1870

- Provincial Boundary in 1870
- Present Boundary
- Important Trails
- One dot represents 50 people
- Towns

(More important settlements are named)

20 0 20 40 60 Miles



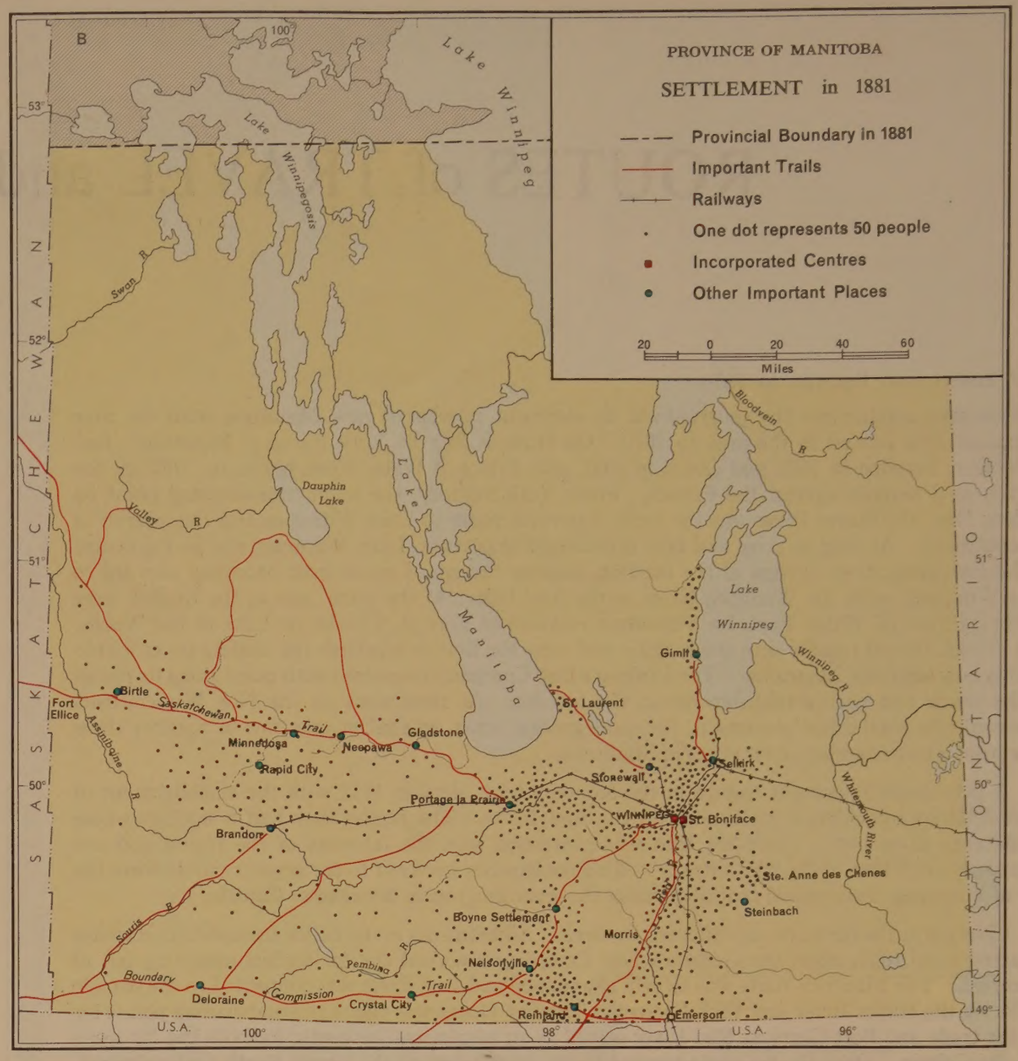
B

PROVINCE OF MANITOBA

SETTLEMENT in 1881

- Provincial Boundary in 1881
- Important Trails
- Railways
- One dot represents 50 people
- Incorporated Centres
- Other Important Places

20 0 20 40 60 Miles



C

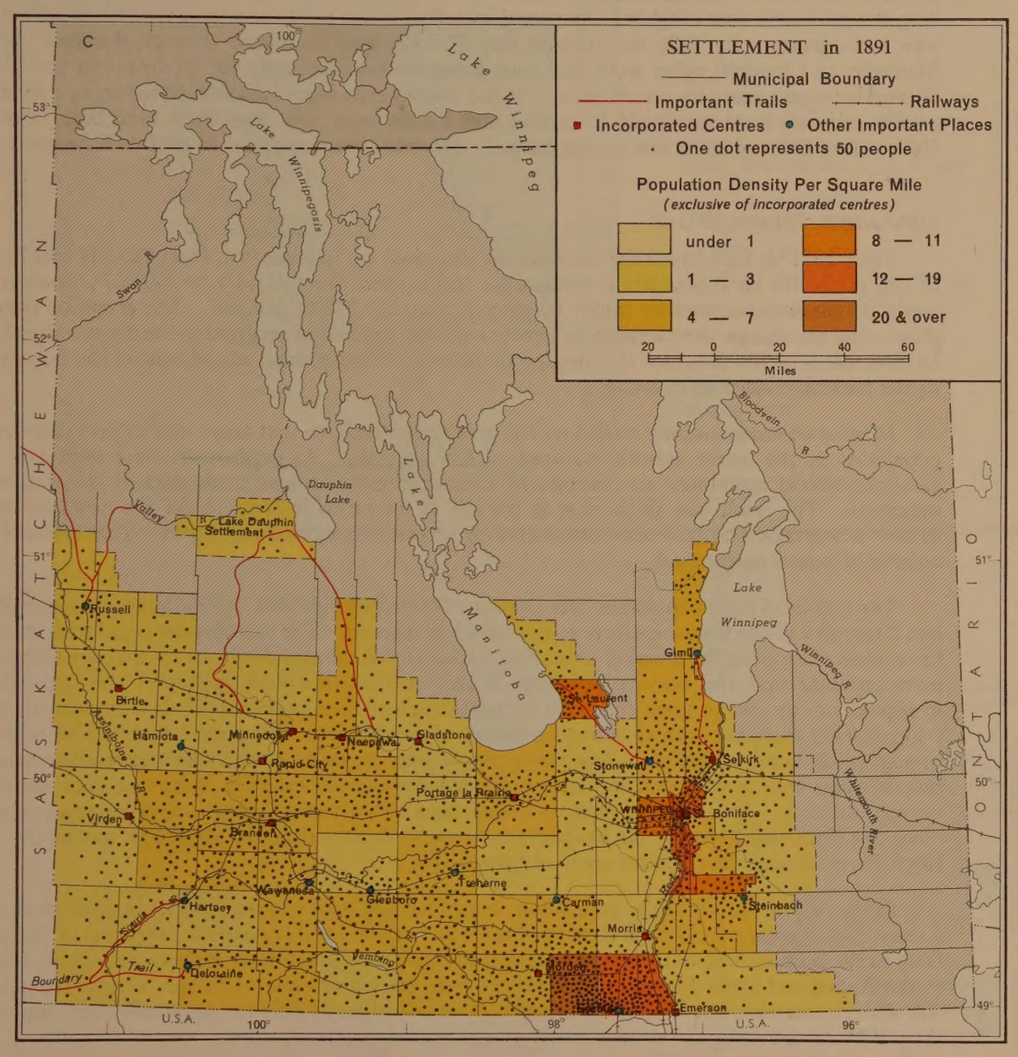
SETTLEMENT in 1891

- Municipal Boundary
- Important Trails
- Railways
- Incorporated Centres
- Other Important Places
- One dot represents 50 people

Population Density Per Square Mile
(exclusive of incorporated centres)

- under 1
- 1 — 3
- 4 — 7
- 8 — 11
- 12 — 19
- 20 & over

20 0 20 40 60 Miles



D

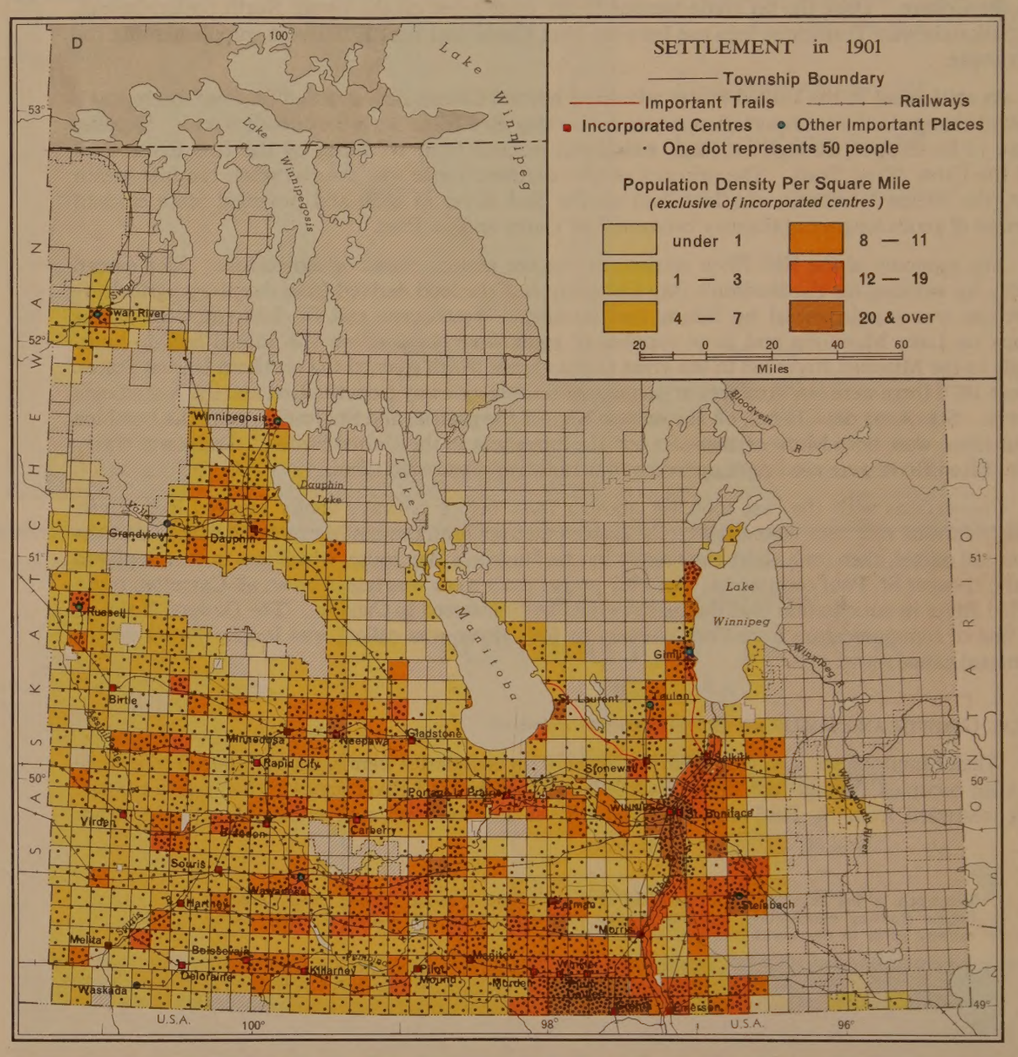
SETTLEMENT in 1901

- Township Boundary
- Important Trails
- Railways
- Incorporated Centres
- Other Important Places
- One dot represents 50 people

Population Density Per Square Mile
(exclusive of incorporated centres)

- under 1
- 1 — 3
- 4 — 7
- 8 — 11
- 12 — 19
- 20 & over

20 0 20 40 60 Miles



E

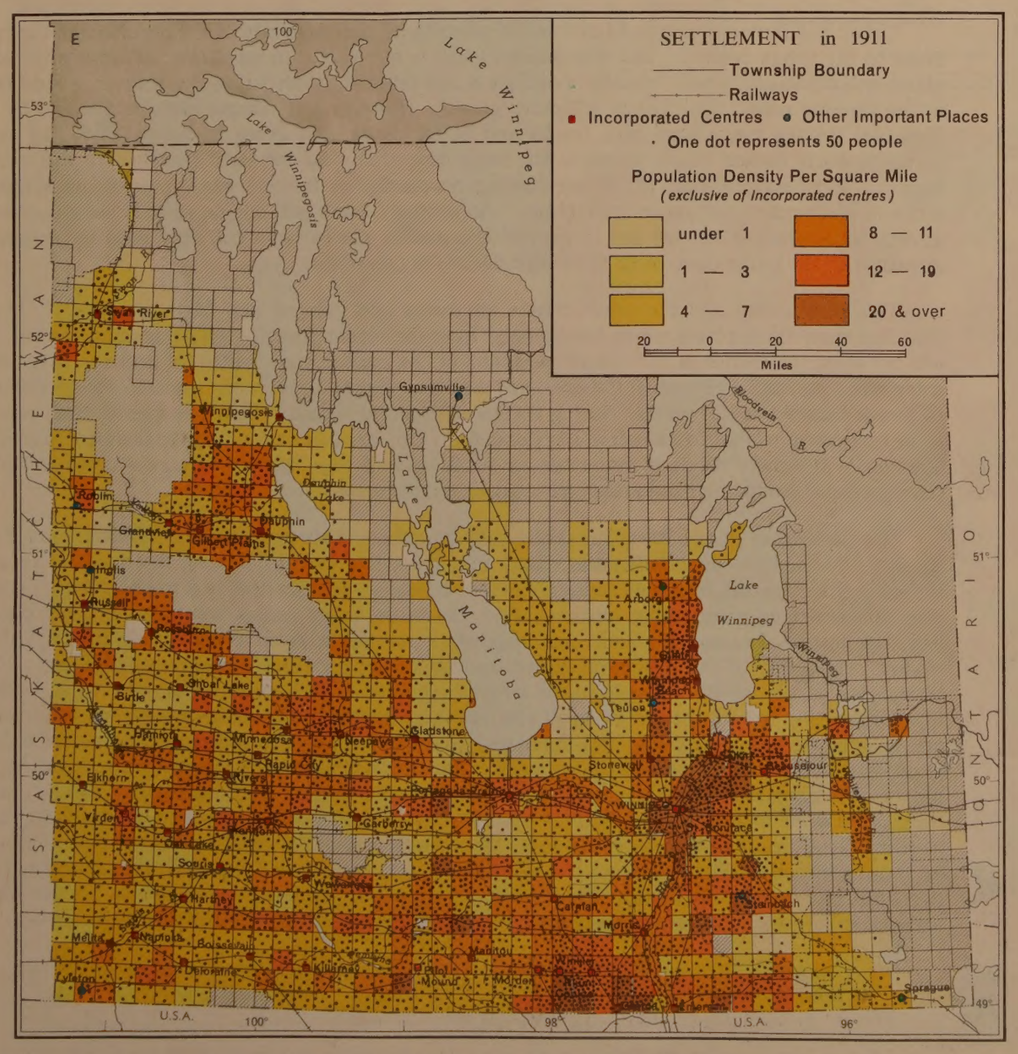
SETTLEMENT in 1911

- Township Boundary
- Railways
- Incorporated Centres
- Other Important Places
- One dot represents 50 people

Population Density Per Square Mile
(exclusive of incorporated centres)

- under 1
- 1 — 3
- 4 — 7
- 8 — 11
- 12 — 19
- 20 & over

20 0 20 40 60 Miles



F

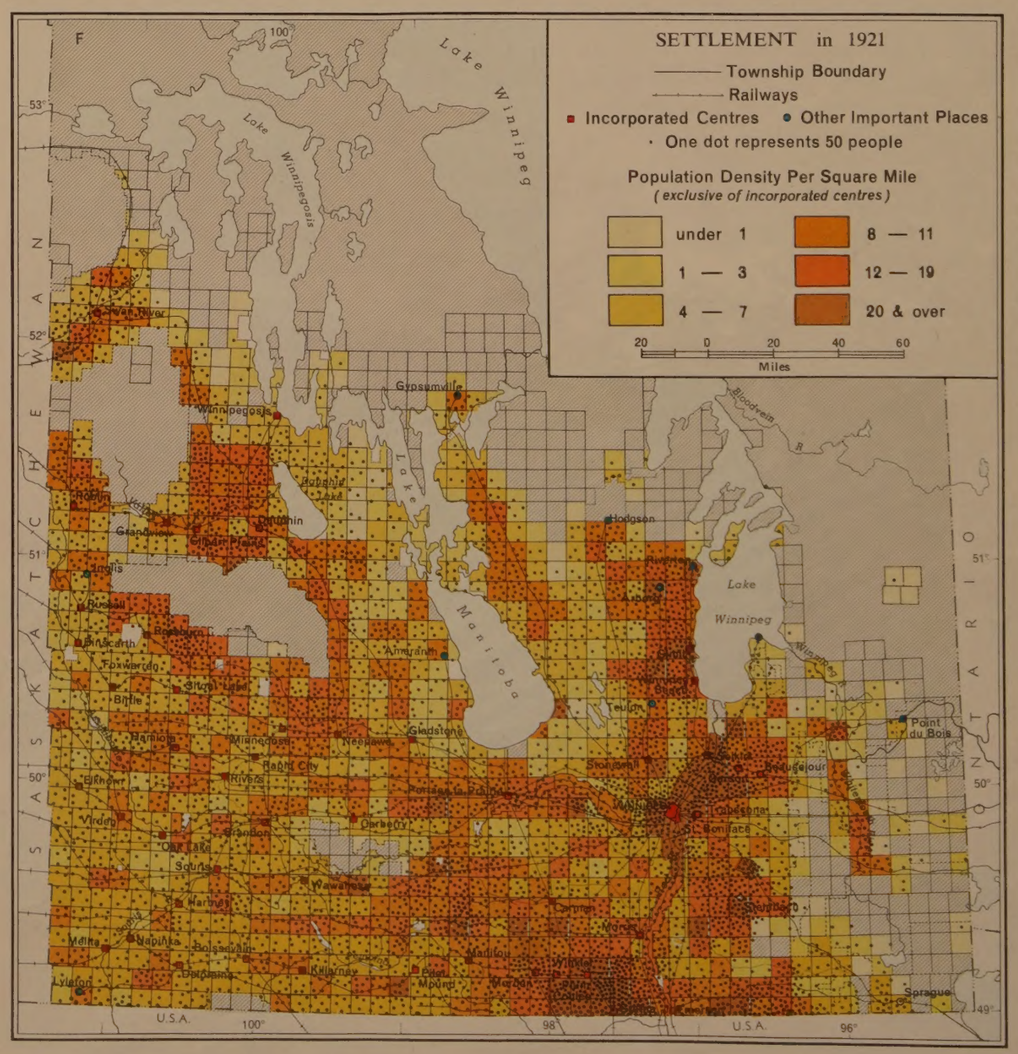
SETTLEMENT in 1921

- Township Boundary
- Railways
- Incorporated Centres
- Other Important Places
- One dot represents 50 people

Population Density Per Square Mile
(exclusive of incorporated centres)

- under 1
- 1 — 3
- 4 — 7
- 8 — 11
- 12 — 19
- 20 & over

20 0 20 40 60 Miles



ROUTES of TRAVEL and POPULATION TRENDS

Settlement and Routes to 1870

This map summarizes the geographical development in what is now Manitoba from the time Europeans first landed in the area to 1870. On Hudson Bay lie York Factory, Manitoba's first settlement, founded in 1682 and closed in 1957, and Prince of Wales' Fort, begun in 1732 by the English as a defence against the French. From York Factory, the main transshipping point on Hudson Bay, the Hayes River was the most important route to Lake Winnipeg and the interior of the continent. As long as river and lake travel were important, Lake Winnipeg was at the centre of the communications system of the interior, because the canoe route from Montreal also led to Lake Winnipeg, with the Winnipeg River as the final link. At the same time as the English were building Prince of Wales' Fort, La Verendrye established Fort St. Charles on Lake of the Woods. The French moved rapidly into the interior and were the first to establish fur trading posts within what is now southern Manitoba. The Hudson's Bay Company countered with posts along its routes in the north and with establishments in the interior. As time went on the Nor' Westers from Montreal also established stations in the same general areas, so that at one time or another there have been a large number of fur posts in Manitoba.

A potentially important change in the economy took place in 1812 with the establishment of Lord Selkirk's agricultural settlement on the Red River. The region thus had a nucleus whose inhabitants developed a viewpoint that was concerned with the interests of the region and not necessarily with that of the fur company. This nucleus has survived to the present day to form the city of Winnipeg, the regional capital of one of the great geographic divisions of Canada.

Changes in the fur trade also affected the area. Adjustments in the major transportation routes occurred after 1821, when the Hudson's Bay Company absorbed the fur traders operating out of Montreal. The Montreal route was largely abandoned and Red River was connected to the outside world via the Hayes River and York Factory. Norway House was one of the marshalling points for the fur trade and Fort Garry at Red River served as an administrative centre for both the fur trade and the Colony. Once the fur trade became firmly established on the Upper North Saskatchewan, the Saskatchewan Trail came into use between Fort Garry and Fort Edmonton, supplementing the river route.

As settlement in the United States advanced beyond Chicago and reached St. Paul, there was a gradual change in the transportation routes connecting Red River with the outside world. Supplies began to be shipped through St. Paul, which was reached from Winnipeg by the Red River Trail and the Crow Wing Trail. The primacy of this southern route was assured when the first steam boat, the Anson Northrup, was launched on the Red River in 1859 and provided more efficient carriage of goods for part of the way between Fort Garry and St. Paul.

The economy of the Red River settlement was not entirely based on agriculture. Men earned money by working for the Hudson's Bay Company and the food derived from desultory agriculture activities was supplemented by fishing and hunting. Westbourne and St. Laurent were fishing camps on Lake Manitoba and large supplies of meat were obtained on the annual buffalo hunt. Trails to the Missouri River led to the great buffalo herds which roamed the northern United States. Before 1870 there were few attempts at permanent settlement away from the Red and the Assiniboine Rivers. Ste. Anne des Chenes, on the eastern edge of the prairie, and St. Joseph, near the Pembina Mountains, were both Metis settlements but the latter was in the United States. Trails and tracks west of Red River were used right up to the time railways superseded them.

Connections with the east took yet another form before railways finally reached Red River. First Manitoba had been connected to the eastern metropolitan centres by the Hudson Bay and the Montreal routes, then for a short time solely by the Hudson's Bay route, which was in turn replaced by the cheaper St. Paul connection. In 1869 preparatory work was begun on an all-Canadian route to Red River in anticipation that the region would be transferred to Canada. The Dawson Road, as the line of communication from Fort William to Red River was called, was largely based on the Montreal canoe route.

Areal Growth and Railroad Development

When Manitoba was created a province in 1870 its boundaries were just large enough to include the then occupied (though not densely settled) parts of the Red River area.[1] That year a railway built westward from St. Paul crossed the Red River at Moorhead, and connected with the steam boat service already in operation for a decade. The Dawson Road was finished the next year but it could not compete with the route through St. Paul and its usefulness was entirely ended in 1878, when the railway from St. Paul to St. Boniface along the western bank of the Red River was completed. Trade was only temporarily conducted via the new railway connections through the United States. The Canadian Pacific transcontinental line was under construction and by 1885 the links with both the Pacific Ocean and the St. Lawrence River at Montreal had been completed.

Winnipeg is the focal point for railroad and air traffic crossing Canada. The Canadian Pacific Railway marshalling facilities located here are among the largest privately owned railway yards in the world.

As the Canadian Pacific Railway was built westwards, settlers occupied the land on either side. In order to bring the newly settled areas under a provincial administration the province of Manitoba was enlarged in 1881 to its present boundaries in what is now the southern part of the province. By 1891, Manitoba east of the Red and south of Riding Mountain, with the exception of the extreme southwest, was reasonably well served by railways. In the next decade some very important new main lines were constructed. A number of tracks were carried into southwestern Manitoba, a line was completed through southeastern Manitoba to the Lakehead, and two great agricultural areas in the north, the Dauphin and Swan River districts, received rail service for the first time. By 1901 all the great agricultural areas of southern Manitoba had railways; after that it was largely a matter of meeting the need for branch lines. Long distances of railway tracks were constructed in the decade before 1911, particularly in western Manitoba. The trackage laid was boosted by a new transcontinental railway which spanned the province in a direct east-west line through Winnipeg. Spur lines were also constructed into the Interlake area and three American lines were pushed into southwestern Manitoba, two extending as far as Portage la Prairie and Brandon in an attempt to tap the grain trade.

After 1911 there was little further railway construction in the developed agricultural areas. More new lines were built into the Interlake area as that country was occupied by Ukrainian settlers, and a narrow gauge line was built from Winnipeg to Shoal Lake in conjunction with a waterworks project. In 1912 the boundaries of Manitoba were extended to their present position in order to keep the province's area roughly proportional with that of the newly created provinces of Saskatchewan and Alberta. By 1930 the Hudson Bay Railway was completed through this new part of Manitoba to Churchill (after work had been going on intermittently for 22 years) to provide an alternative export route for prairie grain. It has proved even more valuable, however, as a means of getting minerals from the Shield to market and a number of spur lines have been built from the Hudson Bay Railway to various mining camps. The latest was completed in 1958 to Thompson.

Population Trends 1941-56

From 1941 to 1956 Manitoba's population increased by 16.5 percent, from 729,744 to 850,040. In this period the rural population declined by 16.7 percent, from 407,871 to 339,457[2], whereas the urban population increased by nearly 60 percent from 321,873 to 510,583. The graph on page 24 shows that the change from a rising to a declining rural population occurred in the decade after 1941. In most parts of the province this decline represents a more rational adjustment of the population to the farming conditions of today.

Manitoba farmers usually settled on 160-acre homesteads, so that there was a fairly dense rural population in the better agricultural areas of the province. As implements were improved and gasoline-powered machinery was introduced farm operations became more efficient but also more expensive. The result was an increase in the size of the farms in order to use the new machinery to best advantage, and to enable the farmer to produce enough to pay for it. This reduced the number of people on the land.

The decline of rural population over southern Manitoba from 1941 to 1956 has not been uniform, and 20 percent of the townships have even showed an increase. The most drastic population changes have taken place along the fringe of settlement, although the changes shown on the map are somewhat more apparent than real because the fringe is only sparsely inhabited (plate 15) and slight shifts in population can cause a great change in the percentage increase or decrease. It is evident, though, that generally there has been an active movement of people within this area, with a decided decrease in population in most districts. The Slavic people who originally settled this area were content to remain where they were placed, but their children have had no hesitation in leaving these marginal farming districts. In a few townships there has been a pronounced increase in population notably along the Winnipeg River, at the St. Laurent Metis settlement on Lake Manitoba, and at the new Birch River farming development north of Swan River.

In the rest of Manitoba the population change has not been so extreme, but in agreement with a trend that is general in Canada there has been a decrease in rural population over most of the area. Only in the poor agricultural lands surrounding the Spruce Woods Forest Reserve and on the fringes of the Riding and Duck Mountains have there been great decreases. Changes in rural population will always continue, but it appears that the main adjustments between population and resources in rural Manitoba under the present farming conditions have been reached.

Urban population trends in Manitoba are affected by the departure of the people from the rural areas to the urban centres. But this general trend is not simple in its effects, because while some places will obviously benefit from the population movements, others will suffer if there is a decrease in the farming population in their tributary areas.[3] Hamlets and villages also are affected by the increased driving range that cars, trucks and better roads have given farmers. They can easily travel to fairly distant larger towns in the same time that they formerly travelled to the nearest hamlet. Furthermore some places are gaining population as farmers move into towns, either to retire or to operate their farms from them. Accordingly there will not necessarily be a consistent growth in all trading centres and in general the smaller places have not kept pace in population growth with the larger ones, often showing a decline in population.

This map shows also the urban trends for towns and villages *over* 500 population. It will therefore show those places which have gained from the recent trend to *larger* trading centres, but will not show the decline or the failure to expand of the smaller ones. In most centres, increases in trade resulting from a change in the extent of their hinterlands, provide one reason for the population to increase more than 20 percent during the 15-year period shown. Increases greater than this are more commonly related to industrial development. Any growth due to industrialization in a town, however, will usually result in better service facilities, and thus make it a more attractive trading town for the surrounding rural areas and so spark further growth.

Readjustments among the urban centres of Manitoba will always continue. One reason for this is related to the individual differences found among service centres. Among the places of roughly the same size there will be some communities that provide better services to farmers, simply because they contain more enterprising businessmen. Therefore, other things being equal, these centres will grow faster. In time, of course, rearrangements may occur again as conditions and individuals change. The effect of changing farm size on trading centres is a wider, more general problem. Even though the current shift of people to the larger communities may continue for some time resulting in a further decrease in the size of small centres, there appears to be little danger that the hamlets and villages will disappear completely in the way that places dependent upon local resources become ghost settlements once the resources are gone. Farmers will always require neighbourhood centres for the easy shipping and processing of produce, and for day to day shopping needs. This is clearly revealed in some of the farming districts southeast of Winnipeg where new hamlets have appeared in recent years to provide services required by farmers. Hence it appears that though there may be considerable changes in population among the urban centres of Manitoba, the general pattern of central places will remain fairly stable, with large towns as the anchor points of the service centre network in the province. Any outstanding growth in a place will be the result of new industries.

[1]The boundaries of 1870 were adjusted slightly in 1877, when the eastern and western boundaries were shifted five miles westward to conform with the sectional land survey.

[2]The farm population decreased from 249,599 to 206,729, a decline of 17.2 percent.

[3]Even an increase in farm productivity in the area will not necessarily compensate for the loss of customers.

PROVINCE OF MANITOBA

SETTLEMENT and ROUTES to 1870

WATER ROUTES

Boat Brigades to Hudson Bay — 1757-

Boat Brigades to Montreal — 1734-

Secondary Routes

Steam Boat Routes — 1859-

LAND ROUTES

Cart trails

Other trails

AGRICULTURAL SETTLEMENTS

Red River Colony

PRINCIPAL TRADING POSTS

Hudson's Bay Company

French Posts

North West Company

PROVINCE OF MANITOBA

AREAL GROWTH

Areal extent 1870–1881

Areal extent 1881–1912

Areal extent since 1912

RAILWAY DEVELOPMENT

1871 1881

1881 1891

1891 1901

1901 1911

1911 1921

1921 1931

Since 1951

Abandoned lines

SOUTHERN MANITOBA

POPULATION TRENDS 1941–56

Percentage change based on 1941 and 1956 data

RURAL TRENDS

Exclusive of all towns over 500 population (1956)

Percent Decrease: under 10; 10 to 20; 20 to 40; over 40

Percent Increase: under 50; over 50

URBAN TRENDS

Inclusive of all towns and cities over 500 population (1956)

Percent Increase: 1 under 20; 2 20 to 40; 3 40 to 80; 4 80 and over

POPULATION of URBAN CENTRES

Population categories indicated by symbols.

500 to 1000; 1000 to 1500; 1500 to 2500; 2500 to 5000; over 5000; M=Military Camp

for Greater Winnipeg see inset

Scale in Miles

METROPOLITAN WINNIPEG

Municipal Boundary

4600 Municipal Population (1959)

Percentage increase 1941-1956

Extent of Urban Area

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

POPULATION DENSITY

Rural Population Density

The map of population density naturally corresponds closely to the dot map showing distribution of population. It provides additional significant information because the population density (number of people per square mile) is a factor of considerable importance in determining the local institutions that an area can support and the kind of community life that develops.

Manitoba's rural population increased from 1870 until 1941, but even before 1941 many areas in the province experienced a decrease in population and this decline has become quite general since 1941 as shown in plate 14. In 1956 over 60 percent of the occupied townships in southern Manitoba had fewer than seven persons per square mile (less than two families). The reasons for variations in rural population distribution in Manitoba were discussed on page 24. Here our concern is more the relationship between rural population density and the nature of farm life in the various parts of the province.

Manitoba's axis of very dense population in the Red River plain can be attributed in varying degrees in the different districts, to the growing of special crops on very small farms, the values that various ethnic groups attach to farm life, and the proximity of the metropolitan market of Winnipeg. The Mennonite district at Gretna and Winkler is one of the most densely settled rural areas in Canada, and provides a good example of how these factors operate. The district is well known for the special crops grown there for canning and processing into vegetable oils and sugar. Among the Mennonite farmers there is still a great love for the soil and for locality, apart from merely a love for what the land produces; and Mennonite farmers tend to remain in the area where their original settlements were founded. As a result farm size has decreased until there are ten and more farm families per square mile in some districts. Because of the dense population and the productivity of the land there has been no problem in constructing excellent roads, establishing schools, and supplying services such as electricity to the farmers. In the Mennonite area east of the Red River, near Steinbach, the population density is also very high. The emphasis on poultry raising in some districts has resulted, since 1940, in the establishment of a number of small farm service centres that supply farmers with special feed and eviscerating facilities. The growth of these centres is a departure from the general western Canadian tendency to a decline in hamlets and small villages.

Adjacent to the Mennonite communities in eastern Manitoba are French farm settlements, laid out in river lots, at St. Pierre, Ste. Anne, St. Agathe and other places. A tendency to remain on the farms and to have large families has produced a high population density in these districts. Since all the farmers live in a line along the front of the river lots it is relatively simple to maintain adequate roads and supply the farmers with other public services. Most of them make their living from mixed farming and dairying.

Heavily occupied river lots with a density of about four families per square mile extend all along the Red River from Selkirk to the United States boundary, and along the Assiniboine to Portage la Prairie. These lots take their form from the settlement pattern laid out in 1813 in the Selkirk colony on the banks of the Red River. The river lots are particularly densely occupied in the truck farming districts close to Winnipeg. French-Canadians tend to occupy the lots on the Red River south of Winnipeg and on the Assiniboine between Winnipeg and St. Francois Xavier, but on the lots along the Red north of Winnipeg, the Ukrainians form the largest ethnic group. They are dominant also on the densely settled lands extending eastward to Beausejour. In this area of intensive agriculture many farms have been subdivided. Since the Ukrainians in some districts have tended to build their farm residences along the main roads, settlement patterns resembling long line villages have developed, providing the service and social conveniences of the river lot form of settlement. A pleasant, thickly settled, European type of country landscape has developed in this area.

Northwards the areas of dense population continue for a short distance along either side of Lake Winnipeg. Farming is not so intensive as in the districts to the south, but the mixed farming economy is supplemented by other activities such as fishing and the recreation industry. The dense population is best maintained along the western shore of Lake Winnipeg towards Gimli, the area originally settled by Icelanders.

There are less closely settled townships within the Red River plain, but in general their densities do not fall below those prevailing in other parts of the province. East of Emerson is a mixed farming district that was developed by Ontario Canadians. This area has a lower population density than the French and Mennonite districts immediately to the west which are located on similar lands. Since all land in this part of the province was settled during the same period, it appears that the variations in population density are due largely to different attitudes towards the land among the ethnic groups. In contrast to the farmers of French, Mennonite and Ukrainian origin, those of British descent appear to favour emigration from a farming area as the population increases, rather than division of the farm lands. This emigration in the past was not necessarily to the cities, but frequently was a move to new homesteads on the frontier of settlement. There are indications that these differences among the ethnic groups are beginning to disappear within the matrix of the North American commercial farming economy, but their effects are still apparent in various parts of the lowland. Immediately east of Winnipeg two rows of less densely settled townships, originally settled by Ontario Canadians, separate denser French and Ukrainian areas to the south and north respectively. There is a similar district northwest of Winnipeg around Stonewall, although poor drainage is also partially responsible for the low density. Southwest of Winnipeg poor drainage conditions restricted settlement for many years. When drainage works made farming possible, the land speculators who had been holding the land turned the area into large wheat farms (plate 18).

Narrow farmsteads reflect early settlement along the Red River and blend with the mosaic of farmland patterns in the agriculturally rich Red River Valley.

In the other belt of close settlement within Manitoba, along the Escarpment, there are no contiguous townships with pronounced population densities. In this belt of settlement there are one or two families per square mile, and it stands out only in contrast to the areas of lesser density to the east and west of it.

Much of the land just above and below the Escarpment south of the Assiniboine was settled by immigrants from Ontario, who quickly recognized the advantages that this land had for mixed farming. British settlers also sought out the best farming land in the beautiful rolling park country between the Assiniboine River and Riding Mountain. These lands quickly developed into one of the outstanding mixed-farming districts in Canada. Prosperous communities developed with substantial towns and a network of good roads knitting various districts together. These facilities, achieved at an early date, have been maintained because the population has not decreased drastically, and today this region contains some of Manitoba's loveliest farm countryside. In later decades similar farming communities were established by pioneers of British origin in the Dauphin and Swan River areas. Ukrainians occupied much of the broken marginal land on the fringes of Riding and Duck Mountains. The satisfaction that is gained by making a living from the land means so much to these people, that the population density has remained quite high in these difficult areas.

Even though there is much outstanding farm land in the belt along the Escarpment, the population densities are not so high as those in the Red River population axis. Even the non-British ethnic groups living here have not tended to build up the same high rural population densities that characterize the districts they inhabit within the Red River lowland. This is partly because this area does not provide the same opportunities for special agriculture that contribute so greatly to the high densities in the Red River area. Also the density of population in the original Ukrainian farming districts is not very high, because there has been a migration from them, into lands vacated by British farmers who have left for the urban centres. Thus, many Ukrainians in migrating, have not actually left the area, and are serving to keep up its population density. This shift in population is particularly characteristic of the Dauphin region.

Within the belt of settlement along the Escarpment the densities go above two families per square mile in only a few districts. Carman is a particularly favoured farming area and has many retired farmers who have remained in the district. There are many relatively small mixed farms near Dauphin and Swan River, and the fishing industry is important at Winnipegosis. But there are a considerable number of townships which have only between one and two families per square mile. These districts are on land particularly well suited for grain growing (or pasture for livestock), as at Treherne and Neepawa, or else are marginal for farming as in the townships south of Riding Mountain and near Ethelbert.

In the southwestern part of Manitoba the population density tends to decrease from about two families per square mile next to the denser belt of settlement to about one family per square mile at the Saskatchewan boundary. This area was settled by Ontario farmers accustomed to mixed farming, but they were sufficiently adaptable to switch to wheat farming when it became evident that this area was ideal country for producing cereal crops for cash sale. Farms quickly increased in size and the result is the lower population density shown on the map. There are some cattle raising areas near the Spruce Woods Forest Reserve and along the Upper Assiniboine that have very low densities as well. The population has tended to decrease throughout this region of extensive agriculture, and this lower population has created some problems in maintaining community services, because it may become prohibitively expensive to provide roads and other public services for a dispersed population. It is questionable, however, whether the decreasing farm population has had a deleterious social effect because, even though farms are farther apart, farmers have been brought closer together in terms of time, as the automobile has replaced the buggy. Community services in an area of low population density can be maintained if farmers move their residences to the main market roads, since this concentration of settlement will reduce the expense of supplying these services. Farmers can also adopt the expedient of moving into towns and operating their grain farms from there. This is occurring in a few places, but the trend is not so well advanced as in Saskatchewan.

Manitoba's largest area of uniformly low population is in the Interlake area. Most townships have less than one family per square mile because there are relatively few farms scattered over this area of generally poor soils and poorer drainage. In most areas there are not enough settlers to support a dense road system, but there are a few better, more closely settled districts. Fanning out from Gimli towards Arborg and Teulon are slightly more densely occupied townships, but west of these places there is a general area of low population density. This is an area of mixed population, including Icelanders, Ukrainians, Metis and settlers of British descent. These people make their living from beef raising and dairying. The area from Lake Manitoba to the better lands along the foot of the Escarpment has similar characteristics.

Eastern Manitoba has many similar problems. East of the Red River population axis there are many townships having fewer than one family per square mile. Many farms here are just operated on a part-time basis, and often only consist of small segments cut out of the bush. Obviously in an area with such a scattered population it is difficult to maintain an adequate roads system and provide good educational facilities. Both these problems have been tackled, however, and great improvements have taken place in recent years. This area has a predominantly Ukrainian population, satisfied to live by obtaining many of their needs from the farm. In the south where pulp wood cutting provides an additional source of revenue there are some French Canadians and Scandinavians as well. In the north the density increases locally along the Whitemouth River where agricultural conditions are better, and also along the Winnipeg River, where there are other alternatives for employment.

Total Population Density

Winnipeg is clearly the centre of the largest continuous area of dense population in Manitoba. Extending out from Winnipeg are narrow areas of dense population. They follow the river lots up and down the Red to Emerson and Selkirk respectively, and up the Assiniboine to Portage la Prairie.

In the rest of Manitoba the distribution of very densely settled townships is determined by the distribution of villages, towns and cities. Since southern Manitoba is an agricultural area it follows that the total population density pattern will be an intensification of the rural population density pattern. In areas where there is a dense rural population there will normally be a closer spacing of farm service centres, and where there is a sparse population there will be fewer centres. The densely occupied rural areas southeast of Winnipeg and in the Pembina Triangle shown on the map of rural population density illustrate this. There are a number of contiguous townships of very high density in these districts.

Contiguous townships of high density, though fewer in number, are also found in the area along the Escarpment, but they are quite rare elsewhere in the province. In southwestern Manitoba, the more densely occupied townships are arranged in a distinctive pattern. They are generally separated from each other by much less densely occupied townships, because the trading centres, which cause the high densities, are more or less regularly spaced through the province along the railway lines. Even Brandon, which stands out distinctly as the centre of the second most densely populated township in Manitoba, is surrounded by townships of much lesser density. The increase of population density in the townships due to these trading centres is not equal throughout the province, because in the more productive western areas the trading centres supported by the farmers tend to be consistently larger than the centres located on the margins of agricultural settlement.

SOUTHERN MANITOBA

RURAL POPULATION DENSITY*

Persons per Square Mile

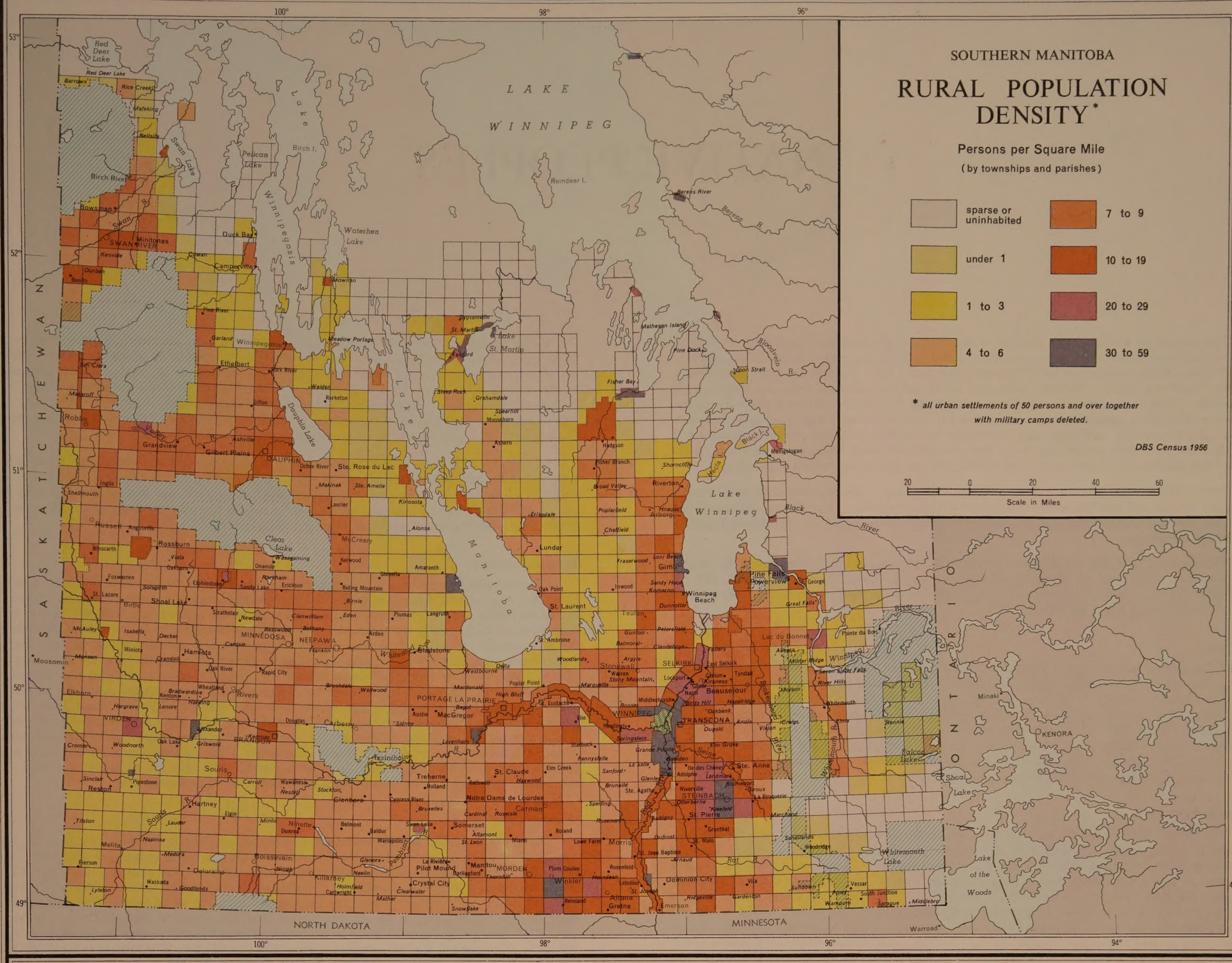
(by townships and parishes)

- sparse or uninhabited
- under 1
- 1 to 3
- 4 to 6
- 7 to 9
- 10 to 19
- 20 to 29
- 30 to 59

* *all urban settlements of 50 persons and over together with military camps deleted.*

DBS Census 1956

Scale in Miles: 20 0 20 40 60


100°
98°
96°
94°
53°
52°
51°
50°
49°
SASKATCHEWAN
ONTARIO
LAKE WINNIPEG
Lake Winnipeg
Lake Manitoba
Lake St. Martin
Lake Winnipegosis
Waterhen Lake
Pelican Lake
Dauphin Lake
Clear Lake
Shoal Lake
Whitemouth Lake
Lake of the Woods
Red Deer Lake
Swan R.
Berens R.
Bloodvein R.
Black R.
Red R.
Assiniboine R.
Souris R.
Whitemouth R.
Birch I.
Reindeer I.
Matheson Island
Berens River
Pine Dock
Fisher Bay
Lundar
Gimli
Winnipeg Beach
Pine Falls
Powerview
Lac du Bonnet
Minaki
KENORA
Falcon Lake
Warroad
Moosomin
Virden
Brandon
Carberry
Portage la Prairie
Winnipeg
Transcona
Selkirk
Stonewall
Steinbach
Morden
Winkler
Carman
Morris
Emerson
Dominion City
Rivers
Minnedosa
Neepawa
Rossburn
Roblin
Swan River
Dauphin
Ste. Rose du Lac
Gilbert Plains
Grandview
Ethelbert
Winnipegosis
Duck Bay
Camperville
Pine River
Bowsman
Birch River
Russell
Binscarth
Foxwarren
Shoal Lake
Strathclair
Hamiota
Miniota
Oak River
Rapid City
Elkhorn
Souris
Hartney
Melita
Pierson
Boissevain
Killarney
Deloraine
Waskada
Reston
Pipestone
Sinclair
Treherne
Holland
Glenboro
Notre Dame de Lourdes
St. Claude
Cypress River
Somerset
Swan Lake
Belmont
Baldur
Ninette
Tilston
Napinka
Lyleton
Goodlands
Crystal City
Pilot Mound
Manitou
La Riviere
Mather
Clearwater
Holmfield
Cartwright
Snowflake
Reinland
Altona
Gretna
Plum Coulee
Rosenfeld
Letellier
St. Joseph
Arnaud
Dufrost
St. Malo
Grunthal
Rosenort
Roland
Miami
Lowe Farm
St. Jean Baptiste
Sandilands
Woodridge
Marchand
Ste. Anne
Landmark
Niverville
Otterburne
Kleefeld
St. Pierre
Rubigny
Dugald
Springstein
Oakbank
Anola
Vivian
Craigs
Elm Creek
Sanford
Starbuck
Grande Pointe
Headingley
Middlechurch
Rosser
Poplar Point
Macdonald
Westbourne
Delta
Woodlands
Argyle
Warren
Stony Mountain
Marquette
Lockport
Gunton
Petersfield
Clandeboye
Balmoral
Teulon
Inwood
Sandy Hook
Komarno
Dunnottar
Great Falls
Fraserwood
Ioni Beach
Oak Point
St. Laurent
St. Ambroise
Riding Mountain
Arden
Franklin
Gladstone
Whitewater L.
Plumas
Langruth
Eden
Birnie
Arborg
Hnausa
Poplarfield
Chatfield
Alonsa
Amaranth
Kelwood
McCreary
Lenore
Hargrave
Wellwood
Brookdale
Austin
MacGregor
Sidney
Douglas
Kemnay
Oak Lake
Griswold
Woodnorth
Cromer
Alexander
Wheatland
Kenton
Bradwardine
Harding
Kenville
Durban
Benito
Minitonas
Cowan
Swan Lake
Barrows
Rice Creek
Mafeking
Bellsite
Red Deer Lake
Ochre River
Makinak
Ste. Amelie
Laurier
Kinosota
Inglis
Shellmouth
Russell
Angusville
Rossburn
Binscarth
Foxwarren
Solsgirth
Elphinstone
Sandy Lake
Erickson
Rackham
Onanole
Wasagaming
Clear Lake
Vista
Oakburn
Strathclair
Newdale
Clanwilliam
Eden
Plumas
Langruth
Bethany
Bassewood
McAuley
Isabella
Decker
Cartale
Arden
Franklin
Gladstone
Whitewater L.
Miniota
Hamiota
Oak River
Rapid City
Elkhorn
Manson
Moosomin
Wheatland
Kenton
Bradwardine
Harding
Lenore
Hargrave
Virden
Alexander
Kemnay
Brandon
Cromer
Woodnorth
Oak Lake
Griswold
Souris
Sinclair
Pipestone
Reston
Carroll
Wawanesa
Nesbitt
Stockton
Glenboro
Hartney
Elgin
Lauder
Minto
Ninette
Dunrea
Tilston
Napinka
Melita
Medora
Pierson
Boissevain
Killarney
Deloraine
Waskada
Goodlands
Lyleton
Holmfield
Cartwright
Crystal City
Pilot Mound
Manitou
La Riviere
Mather
Clearwater

NATIVE PEOPLES

The Indians in Manitoba are divided in fifty bands. The smallest, numbering 23 Indians, lives on Gamblers Reserve ten miles southwest of Birtle, while the largest, living on the shores of Island Lake, 285 air miles northeast of Winnipeg, numbers 1,699. In 1958, the total population of the fifty bands was 22,077. In 1934, there were 12,958 Indians registered under the Indian Act in Manitoba. Thus, in 25 years, the population increased by 70 percent. In recent years the natural increase of the Indian population has been higher than that of any other ethnic group in the province. Lower infant mortality and higher age expectancy has resulted in an annual natural increase of slightly more than three percent per year. Previously it was much lower, and earlier still, at the turn of the century, the Indian population of Manitoba was decreasing instead of increasing.

Four different languages are spoken by Manitoba Indians. The two largest language groups, the Cree (10,245) and the Saulteaux (10,212) are of Algonkian stock. The Chipewyan, numbering only 541, speak an Athapascan language, while the Sioux (1,079) belong to the Dacota family of that linguistic group.

The Sioux are located in the southwest portion of the province and the Chipewyan in the extreme northern part. The Cree and the Saulteaux are neighbors occupying the central portion, with the Cree generally found in the northern half and the Saulteaux in the southern portion. A few reserves have both Saulteaux and Cree Indians.

Treaties

A Royal Proclamation in 1763 stipulated that no Indian could be dispossessed of his lands without his consent and that of the Crown. In return for the surrender of Indian interests in Canadian soil, the Crown undertook to set aside reserves and guarantee certain other benefits such as cash payments, annuities, free schooling and other benefits. All Manitoba Indians, except the Sioux, have signed treaties with the Crown after Manitoba became a province of Canada. The Sioux, having come into Canada only a few years prior to 1871, were not considered as having established ownership of any Manitoba soil. No treaty was signed with them. They were assigned to reserves however, and given the same consideration as other Indians.

Administration

The British North America Act (Sec. 91) charged the Federal Government with the administration of Indian affairs. To deal with the Indians, the Federal Government created a special branch known as the Indian Affairs Branch of the Department of Citizenship and Immigration. The Minister of that Department automatically holds the title of Superintendent General of Indian Affairs. Among the important functions of the Indian Affairs Branch are the management of Indian reserves and surrendered lands, tribal and band funds, descent of property, treaty obligations, enfranchisement, education, welfare, health, social assistance, family allowances, rehabilitation of Indian veterans on reserves and a variety of other matters. The senior officer of the Indian Affairs Branch in the province is known as the Regional Supervisor of Indian Agencies for Manitoba. For administrative purposes, the province is divided into eight agencies, each directed by an Agency Superintendent responsible to the Regional Supervisor. The Regional office also has a number of staff persons specialized in welfare, conservation, education, housing and employment, who assist and advise the Regional Supervisor and Agency Superintendents in the performance of their duties. During 1958, the Indian Affairs Branch spent $3,811,612 for the Indians of Manitoba.

Immediately after signing the treaties, the Federal Government was considered to have the sole responsibility for Indian affairs. With the passing of time and the establishment of more comprehensive systems of communication, destroying the isolation of Indian reserves, the people of Indian descent became a concern of provincial and municipal authorities as well. Indians in Manitoba were granted the right to vote in provincial elections in 1953. A new Social Allowance Act, passed in 1959, declared the Indians eligible for provincial welfare benefits. In the same year Indians were also accepted in the Manitoba Hospital Services Plan which is a province-wide system for prepaying hospital costs in the form of monthly insurance premiums. Indian band councils also receive per capita grants from the province on the same basis as rural municipalities. Generally speaking, the trend in Manitoba is to give Indians the same benefits as are available to other residents of the province.

Residence

As mentioned earlier, the Crown agreed in signing the treaties to set aside some land for each Indian band who would request it. Approximately 520,000 acres have been reserved for that purpose and distributed to 45 of the 50 bands. Five bands have never been assigned reserves. These include the Chipewyan at Churchill, the Fox Lake band at Gillam, the York Factory band at York Landing, the Shamattawa band at Shamattawa and the Long Plains Sioux at Portage la Prairie. Close to 20 percent of the Indian population does not live on reserves. It is estimated that close to 2,500 have settled in predominantly white communities, while another 1,500, including those who were never assigned reserves, are living in small bands on non-reserve lands assigned to them by the province or puchased or leased for them by the Indian Affairs Branch.

Occupation

Traditionally, Indians have lived on the proceeds of trapping, hunting, fishing and other food gathering activities. Fourteen bands still listed fishing as their main occupation in 1958 and ten listed trapping. Of the remaining twenty-six bands, twelve gave farming as their main source of income, seven gave casual and industrial employment, five gave lumbering and two listed the picking of seneca root as their main occupation.

The economy of the Indian population is presently shifting from trapping and fishing to lumbering and industrial employment. The working force of construction and road building firms include many Indian men. Indians are also making valuable contributions as woodcutters for pulp and lumber operators. An intensive training program, introduced recently by the Indian Affairs Branch, has resulted in many young adults being employed by industry as semi-skilled and skilled workers. In addition, some are receiving professional training.

Education

Early efforts to educate Indian children in Manitoba were wholly religious in character. A Church of England chaplain to the Hudson's Bay Company conducted a boarding school on the Red River as early as 1822. A Roman Catholic priest opened an agricultural school for young Indians at Baie St. Paul in 1833. Anglican, Roman Catholic and Methodist missionaries conducted day schools for Indians in various parts of the province before Manitoba became a province of Canada in 1870.

The education of reserve Indians is now the sole responsibility of the Indian Affairs Branch. In 1956-57 there were 37,305 Indians attending school in Canada. Of this number 31 percent attended residential schools, 52 percent were attending day schools operated by the Branch and 17 percent were in schools not operated by the Federal Government. In Manitoba for the same year there were 4,647 Indian pupils, with six percent attending provincial or private schools. The policy of the Branch is wherever possible to educate Indian youths in the same schools as other children. This policy is difficult to implement in Manitoba because of the isolation of Indian reserves. However, some progress is being made each year with the construction of all-weather roads, the erection of new classrooms in non-Indian communities and the introduction of larger units of school administration.

Indian schools use the same curriculum as provincial schools with some adaptions frequently being made in the primary grades to overcome the language difficulties which may exist. Schools are denominational in that the Branch attempts to hire teachers of the same religious persuasion as the pupils. Where there are enough pupils of different faiths, two or more schools may be built in the same community. Residential schools are also denominational. However, in both day and residential schools, the provincial curriculum is followed and religious instruction does not exceed the half-hour time limit stipulated in the federal regulations.

Schooling at all levels is available free of charge to all reserve Indians. While only a few Indian pupils reach university, an increasing number each year attend high school and receive technical and vocational training. In some cases Indians not living on reserves may also be provided with free education although Indians that have settled permanently in white communities are usually expected to pay local school taxes and send their children to local schools.

Enfranchisement

Close to 1,500 Indians have been enfranchised in Manitoba in the last twenty years. Enfranchisement, as used here, does not mean the right to vote in provincial or federal elections. It refers, rather, to a legal process by which an Indian gives up all the rights and privileges to which he is entitled as an Indian under the Indian Act. Upon enfranchisement, he ceases to have the right to live on a reserve. He must sell to other Indians whatever property he owns on the reserve. He has to pay income tax, finance the education of his children, accept responsibility for medical and hospital care and lose whatever special privileges Indians may have for hunting, trapping and the use of natural resources. In return, enfranchised Indians receive in a lump sum the equivalent of twenty years of annual treaty payments or $100.00 and their share of the band funds. Band funds are the monies earned and saved by each band. Such monies are usually accumulated from sale of reserve land and of natural resources on the reserve or from any investments or business transactions which a band council may undertake on behalf of its charges. The combined annuity and band fund payments represent appreciable sums in some instances, while they are negligible in others. In some cases, they may help families to settle permanently in white communities.

The Metis

Explorers, fur traders and adventurers travelled through what is now Manitoba from the first decade of the seventeenth century to the first decade of the nineteenth century, or nearly 200 years before Jean Baptiste Lagimodiere brought the first white woman to the prairies as his wife. There were born during that time many children of Indian mothers and white fathers. The existence of a group of persons quite different from the Indians and from the white persons was mentioned as early as 1749 by J. Isham in his Journal written from the shores of Hudson Bay. The Metis population (Metis was the name given to the people of mixed ancestry) grew in the south as well. When the first census of the new province of Manitoba was taken in 1870 there were 9,840 Metis in that small area in the vicinity of the Red River which became the new province. At that time the Metis accounted for 82 percent of the population of the province.

It was natural that such a large majority should have tried to influence the authority of the land in which they lived. The Metis felt that they did not have sufficient influence upon their governing authority and several times between 1800 and 1870 they took a united stand against the legally constituted authority of that period. When it became evident to them that Manitoba was to become a province of Canada, they requested that this transfer should not take place without their being consulted. When it appeared to them that they were not likely to be consulted, they placed their support behind leaders who brought their case to the attention of the Federal Government in Ottawa and of the Crown in London, England. It is within this framework that the leadership of Louis Riel took root and grew to a full chapter in the history of western Canada.

With the passing of the Riel Government and the arrival of countless immigrants from eastern Canada and Europe, the Metis became a minority numerically as well as politically. Some left the province for Saskatchewan, North Dakota and Montana, while the majority of those that remained were assimilated by other ethnic groups. A small number were unwilling or unable to accept the new way of life which followed the incorporation of Manitoba as a Canadian province. Some isolated themselves on the shores of lakes or the edge of forests to pursue a little longer their traditional occupations of fishing, hunting and trapping. Some settled on the fringe of white communities and attempted to earn a living from industrial and commercial jobs, while others settled on farms in the vicinity of the Red River Valley.

Most of the descendants of the Metis of 1870 have been assimilated. The persons who are identified as Metis in Manitoba today are mainly those whose physical characteristics resemble those of the Indians and whose living standards are lower than those of the white majority. A survey completed in 1959 estimated that there were close to 25,000 such persons in the province at that time. Twenty-five percent of the breadwinners in that group held permanent jobs, usually linked with industrial and commercial undertakings. Ten percent were farming. Lumber and pulp operations gave work to fifteen percent, while another fifteen percent were engaged in seasonal work related to the gathering of natural resources such as fish, furs, rice, seneca root and wild berries. Thirty-five percent were casual laborers frequently unemployed and moving from one type of laboring job to another.

Approximately ten percent still use an Indian language for conversing in their homes, thirty-five percent use French and the remainder employ English. However, English is spoken fluently by all but a very small minority. From the point of view of religious persuasion, over seventy-five percent are Roman Catholic, while the majority of the remainder are affiliated with either the Anglican or the United Church. Culturally, they share the way of life of other low income groups in American and Canadian society. While one can still find among them some of the customs which prevailed during the pioneering era, most of these have been discarded in favor of the behavior patterns generally followed in our civilization.

Since the end of the second world war, Manitobans have shown a keen interest in the problems of the Metis. Voluntary organizations and private citizens have urged that the provincial government offer special assistance to enable that population to share in the general prosperity of their fellow citizens. The 1956 session of the Legislature passed a bill authorizing the government to undertake a socio-economic study of the population of mixed Indian and white descent. The findings of the study were published in the spring of 1959.[1] A program of community development and employment was authorized in 1960 by the Provincial Government.

The Eskimos

The administration of Eskimos in Canada is the responsibility of the federal Department of Northern Affairs and Natural Resources. As a means of providing a southern outpost to its northern settlements, the Department has established a residential and rehabilitation pilot project at Churchill. The average Eskimo population at Churchill during the year is 150. They live in government-owned houses. Some Eskimos are brought to Churchill to be placed in full-time industrial and commercial employment. Others come to receive special training or medical care, while others are there only temporarily as they wait for suitable weather conditions and transportation facilities to return to their northern settlements.

[1]Lagassé, J. H., The People of Indian Ancestry in Manitoba, a Social and Economic Study, Queen's Printer, Winnipeg, 1959, 3 volumes.

MANITOBA

NATIVE PEOPLES

ESKIMO POPULATION — 130

POPULATION of INDIAN BANDS
area of circle is proportional to numbers in bands
1000 · 500 · 100

BAND NAME
BIRDTAIL SIOUX

INDIAN RESERVES

FACILITIES
Day school · Residential school
Hospital or Sanitorium
Nursing station
Agency headquarters

LINGUISTIC DIVISIONS
Approximate boundary between families
Approximate Language group boundary

LINGUISTIC FAMILY	LANGUAGE GROUP	DIALECT GROUP
Athapaskan	*Chipewyan*	
Algonkian	*Cree*	*Swampy Cree*
	Saulteaux	
Siouan	*Dakota*	

ECONOMIES
Indicated by numbers in order of importance

1 *Fishing*
2 *Farming*
3 *Trapping*
4 *Construction*
5 *Lumbering – Pulp cutting*
6 *Seneca root picking*
7 *Wild rice gathering*
8 *Frog catching*
9 *Mining*
10 *Blueberry picking*

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

ETHNIC GROUPS

TRENDS

The agricultural areas of southern Manitoba were largely occupied by 1921 (Map 14). By that time all the ethnic groups that make up the population of the province were established in their settlements. Since 1921, however, a considerable movement of people has continued in and out of Manitoba. This, together with variations in the rate of natural increase of the different ethnic groups, has resulted in changes in the proportions of the various ethnic groups in the province.

	1921		1951	
ETHNIC GROUP	NUMBER	PROPORTION OF POPULATION	NUMBER	PROPORTION OF POPULATION
British	350,992	57.5%	362,550	46.7%
Ukrainian	44,129	7.2%	98,753	12.7%
French	40,638	6.7%	66,020	8.5%
German	19,444	3.2%	54,251	7.0%
Mennonite[1]	21,295	3.5%	44,667	5.8%
Polish	16,594	2.7%	37,933	4.9%
Scandinavian	26,698	4.4%	32,921	4.2%
Jewish	16,593	2.7%	18,840	2.4%
Others	73,735	12.1%	60,606	7.8%
TOTAL	610,118	100%	776,541	100%

[1]Includes Hutterites.

Large numbers of people have moved from place to place within the province, both from one farm area to another, and also from the farms to the cities. In spite of these various migrations the original districts in which the different ethnic groups settled still stand out as the centres for those peoples. Some ethnic groups have, however, tended to spread out from their original settlements and move into areas occupied earlier by other groups. At present there are particular groups (like the Mennonites and Slavs) which tend to remain agriculturists. In the case of the Slavs this partly results from the fact that these people were originally placed on marginal land. They now have the opportunity to improve their fortunes by moving into good farming districts that have been vacated by farmers who have in turn thought that they were improving themselves by moving into the cities. Probably it is still permissible to attach some ethnic significance to these migrations, because Manitoba has not been settled long enough for the individuals in each group who may or may not like farming to be sorted out. Perhaps the next generation will see the departure to the cities of more members of ethnic groups that are now considered strictly agricultural.

BRITISH (18A)

Manitobans of British origin are the most widely and evenly distributed ethnic group within the southern part of the province. Only the southeastern part of Manitoba, some sections of the Interlake area and parts of northwestern Manitoba have relatively few people of British origin. The Selkirk settlers, of course, occupied the lots along the Red River north of the Assiniboine but their descendents have been largely replaced by other ethnic groups. The Springfield area and the district about Stonewall were settled by people of British origin who came from Old Ontario, and there was a similar small pocket of these people northeast of Emerson.

But the main British area is in southwestern Manitoba. The best lands in this country were quickly taken up, particularly in the decade of 1880, by experienced farmers from Ontario who developed one of the most substantial farming areas in Canada. This countryside still has many large, solidly built, brick farm homes, and many barns with walls of stone. Interspersed with the Ontario settlers were many people who came directly from Great Britain. Along the Assiniboine above Virden there was a definite enclave of Old Country settlers, and these people also acquired land in the lovely countryside that stretches from the Assiniboine towards the Riding Mountains. The area from Neepawa to Dauphin, the valley to the west of Dauphin, and the Swan River country were settled somewhat later, but all the early homesteaders were predominantly of British origin.

In recent years many of the young people have been leaving the farms for the cities, but the area of British settlement was vast, and composed almost exclusively of this single ethnic group, so that the ethnic character of southwestern Manitoba, in particular, has not changed significantly. There are still municipalities in the southwest in which over 80% of the total population is of British origin. Only in the fringe areas of British settlement has a significant change taken place.

UKRAINIAN AND FRENCH (18B)

Settlers of Ukrainian origin are not evenly distributed over the province but are concentrated in five well-defined districts. Most Ukrainians came to western Canada after the turn of the century, by which time the best lands of Manitoba had been homesteaded. Many settled west of Manitoba but large numbers were placed within the province in group settlements on the margins of the homesteaded areas. On these forested lands the Ukrainians were practically communities unto themselves, ekeing out a difficult livelihood from mixed farming and by obtaining outside work for part of the year. The nuclei of these settlements are clearly apparent on the map: east of Emerson at Stuartburn, northeast of Winnipeg, in the Interlake area west of Arborg, east of the Duck Mountains in the vicinity of Ethelbert and south of Riding Mountain. Many Ukrainians are now living in cities, but the older generation has tended to remain on the farms. Other Ukrainians have moved from the original regions of settlement into better farming areas. This process is well underway in the Riding and Duck Mountain areas where the Ukrainians have been moving down from the mountain slopes. The occasional farmer of Ukrainian origin is also found in the southwestern part of the province. A distinctively Ukrainian landscape can still be found in the original settlements. Cottages with shining whitewashed plaster walls and thatched barns may still be seen. The distinctive churches with their bulbous towers are found not only in the rural districts but also in many Manitoba trading centres where there are people of Ukrainian descent.

Despite the fact that people of French ethnic origin have been in southern Manitoba since the time of La Verendrye, their settlements are spotted in clusters. This is because Manitoba was never subjected to a general invasion of homesteaders from Quebec corresponding to that which set forth from Ontario. There are many important French communities along the Red, Assiniboine, Seine and Rat Rivers in the Manitoba lowland. These settlements were founded as Metis communities, but later arrivals included French-Canadians from Quebec and people of French-Canadian origin from New England. A French-Canadian colony was established at Letellier, and another at Notre Dame de Lourdes, which has become the centre of a French and Belgian settlement. Metis farmers had already settled near St. Claude and Haywood, so that there is a salient of French settlement from the Assiniboine at St. Francois Xavier into upland Manitoba. Along the shore of Lake Manitoba, at St. Laurent, and at the crossing of the Upper Assiniboine at St. Lazare, there are Metis settlements of long standing. The Ste. Rose du Lac settlement was intended as a colony for settlers from France, but later migrations of French-Canadians supplied much of the population. Another French settlement is located north of Roblin. The appearance of many of these French villages is enhanced by the beautiful churches about which the homes are grouped. In the rest of the province the population of French origin is relatively scattered, although there is a sprinkling of French Canadians on the fringe of settlement all the way from the southeastern corner of the province to north of Swan River.

MENNONITES AND SCANDINAVIANS (18C)

The Mennonites are concentrated on either side of the Red River in two areas that were reserved for their exclusive use in the decade beginning in 1870. These lands have remained almost exclusively Mennonite since that time, and the Mennonites have even tended to expand into adjacent areas. They have moved westward from Winkler and northward to Morris. On their original lands there are still some distinctive Mennonite buildings with house and barn together, and between Gretna and Winkler some of their agricultural villages are still in existence. After World War I there was a renewed migration of Mennonites from Russia. Many settled in Winnipeg but others moved onto lands immediately south of the Assiniboine. The Mennonites have not dispersed widely over the province, although they are moving into good farm land northwest of Portage la Prairie, and are buying farms on either side of the highway between Boissevain and Morden.

The distribution of Scandinavians in Manitoba also reflects the locations of the early colonies of this group, but these settlers have spread more widely through the province than the Mennonites. Around Gimli, the original area of settlement of the Icelanders in the 1870's, there is still the greatest concentration of Scandinavians. Their livelihood is based on fishing and mixed farming. Other colonies for Icelanders were set aside along the eastern shore of Lake Manitoba, where a good number of these settlers have remained, and at Glenboro, where they are not nearly so concentrated and have tended to scatter southwards. North of Minnedosa there is a cluster of Scandinavian people stemming from a group colonization scheme of the 1880's. Elsewhere in the province Scandinavians have taken up land on an individual basis. They have tended to favour the Swan River Valley, and have also occupied farm land northwest of Portage la Prairie. Many have taken up residence in an arc around the southern end of Lake Winnipeg from Gimli to the Winnipeg River. Scandinavian farmers have moved in limited numbers into southwestern Manitoba, and there has been a migration into the southeastern corner of the province from northern Minnesota.

POLES AND GERMANS (18D)

Germans have settled in large numbers near Beausejour and along the Whitemouth River, where they make their living from mixed farming and dairying. In southern Manitoba, Germans tended to settle in the same areas as the German-speaking Mennonites, but in far smaller groups. In the Interlake area they are thinly scattered about Gimli, but are greater in number in the beef raising area between Eriksdale and Gypsumville. German colonies were established northeast of Neepawa and at Russell in the 1890's. After 1900, settlers from German colonies established in Saskatchewan homesteaded in the Roblin area and in the Swan River Valley, where they are well represented today. Small colonies of Germans were established at various other places in southern Manitoba, but no large concentrations developed. People of German origin, however, are scattered throughout the agricultural areas of Manitoba.

The Poles are more or less associated with the Ukrainian settlements, though of course they are far fewer in number than the Ukrainians. Their greatest density is in the vicinity of Beausejour, where they are closely mingled with the Germans, and from that centre a wide belt of Poles extends towards Arborg. Their other area of residence is on the southern margin of Riding Mountain where they are quite widely dispersed, and in an arc through the Roblin district towards Dauphin. This corresponds to the area occupied by Ukrainians. Poles also live in the Swan River Valley and they are scattered through southwest Manitoba.

RELATIVE IMPORTANCE OF ETHNIC GROUPS (18E)

This map is only a partial summary, though a very revealing one, of the distribution of ethnic groups in Manitoba. It shows the single largest ethnic group for each municipality, but does not reveal the many varieties of peoples that may be found in any area.

The British are numerically dominant over all of southern Manitoba except for a central diagonal belt of settlement from the southeastern corner of the province to Dauphin and Winnipegosis, which is divided among the other ethnic groups.

The dominance of any one ethnic group in the municipalities of this central belt is generally (though not always) determined by the locations of the original settlements of the various groups. The French, for instance, have a majority along the Red River from Emerson to Winnipeg (except at Morris where the Mennonites west of the Red outnumber the French farmers on the river lots), in the St. Pierre, La Broquerie, and Ste. Anne districts in the southeast, and at St. Laurent, Ste. Rose du Lac, St. Lazare and the district north of Roblin in the rest of the province. In the area of French plurality south of Portage la Prairie and west and east of Winnipeg, too many other groups have settled to enable the French to retain a majority. In the southeastern corner of Manitoba, east of Riding Mountain and along the Waterhen River, there has always been a great mixture of peoples, with the French group having the plurality.

The Germans have a plurality along the Whitemouth River and north of Neepawa, both areas of early German settlement, and also along the northeastern shore of Lake Manitoba. The Mennonites not only have a majority in the lands originally reserved for them, but have attained majorities in the Morris and Morden areas.

This map also shows the Hutterite settlements of Manitoba. The Hutterites did not migrate to this country directly from Europe but entered Manitoba from South Dakota in the years following World War I. Their colonies are concentrated south of the Assiniboine in the Elie district. Their rate of natural increase is high, and since they are a farm people, they have been establishing daughter colonies to support their increasing numbers. Within Manitoba colonies now are found as far east as Brokenhead and as far west as Brandon.

The Scandinavians still have a majority in the original Icelandic settlement at Arborg, though no longer in Gimli municipality. North of Minnedosa, they form a plurality in the district settled as a Scandinavian colony.

The Ukrainians dominate an area of southern Manitoba second in size only to that occupied by the British. In southeastern Manitoba they have a majority in the Stuartburn district and a plurality over a wide area east of Winnipeg. They also have either majorities or pluralities in the northeastern part of the Interlake area, in the Ethelbert district and along the southern fringe of Riding Mountain.

ETHNIC GROUPS IN URBAN CENTRES (18F)

The populations of the urban centres reflect both the proportion and the distribution of ethnic groups within Manitoba. Many settlers who came to Manitoba settled immediately on the farms, but since all the ethnic groups present in the province have been here for at least 60 years, there has been much migration to the urban centres, and all the groups are now represented in the cities. This table shows, however, that the various ethnic groups are not identically represented in town and country.

COMPARISON OF RURAL AND URBAN ETHNIC GROUPS—1951

	FARM POPULATION		RURAL POPULATION (Inclusive of Farm Population)		URBAN POPULATION	
ETHNIC GROUP	NUMBER	PROPORTION	NUMBER	PROPORTION	NUMBER	PROPORTION
British	77,717	36.2%	129,086	38.3%	233,464	53.0%
Ukrainian	38,166	17.8%	49,406	14.7%	49,347	11.2%
French	18,547	8.6%	34,996	10.4%	31,024	7.1%
Mennonite	28,113	13.1%	33,419	9.9%	11,248	2.6%
German	20,554	9.6%	25,845	7.7%	28,406	6.5%
Polish	12,666	5.9%	16,404	4.8%	21,529	4.9%
Scandinavian	9,437	4.4%	15,332	4.6%	17,589	4.0%
Jewish	62	.....	229	.....	18,611	4.2%
Others	9,173	4.4%	32,244	9.6%	28,362	6.5%
TOTAL	214,435	100.0%	336,961	100.0%	439,580	100.0%

The ethnic composition of each small centre tends to reflect that of its immediate hinterland. As the ethnic character of the hinterland changes there is, after a lag of some years, a corresponding change in the urban centre. Beausejour, for instance, truly reflects the very mixed ethnic character of its tributary area. Morden was once a predominantly British town but the Mennonites now make up the largest proportion of inhabitants, a direct correlation with the shift in population which has taken place in its hinterland.

But as centres increase in size their ethnic compositions no longer correspond so directly with those of their immediate hinterlands. Portage la Prairie and Brandon, for instance, still reveal the British ethnic character of their hinterlands, but they have also attracted a wider variety of ethnic groups than have the smaller towns of southwest Manitoba. Winnipeg best exemplifies the tendency for a wide variety of ethnic groups to collect in large urban centres; actually it has an ethnic composition that is much more cosmopolitan than that of the rest of the province. The Jewish people in Manitoba, to take just one example, are practically all concentrated in the capital city. The Pas and Flin Flon do not possess surrounding agricultural areas from which to attract their populations, and thus had to draw their people from elsewhere. Consequently the same processes are at work as in Winnipeg, except on a smaller scale, and these towns display a wide variety of ethnic groups.

A

Distribution of Population by Origin
BRITISH
• one dot represents 50 people
(inclusive of all centres under 1000)

5000
2500
1000
500
200

Circles indicate population of British origin residing in incorporated centres of 1000 and over (excepting Winnipeg)

DBS Census 1951

20 0 20 40 60
Miles

B

Distribution of Population by Origin
UKRANIAN AND FRENCH
one dot represents 50 people
(inclusive of all centres under 1000)
• Ukranian • French

5000
2500
1000
500
200

Circles indicate population of Ukranian (black) and French (red) origins residing in incorporated centres of 1000 and over (excepting Winnipeg

DBS Census 1951

20 0 20 40 60
Miles

C

Distribution of Population by Origin
MENNONITE AND SCANDINAVIAN
one dot represents 50 people
(inclusive of all centres under 1000)
• Mennonite • Scandinavian

5000
2500
1000
500
200

Circles indicate population of Mennonite (black) and Scandinavian (red) origins residing in incorporated centres of 1000 and over (excepting Winnipeg)

DBS Census 1951

20 0 20 40 60
Miles

D

Distribution of Population by Origin
POLISH AND GERMAN
one dot represents 50 people
(inclusive of all centres under 1000)
• Polish • German

5000
2500
1000
500
200

Circles indicate population of Polish (black) and German (red) origins residing in incorporated centres of 1000 and over (excepting Winnipeg)

DBS Census 1951

20 0 20 40 60
Miles

E

Percentage Distribution of Ethnic Groups in Urban Centres

Each graph sector is a percentage of the total population

British — *Polish*
French — *Scandinavian*
German — *Ukranian*
Mennonite — *undifferentiated*

THE PAS
FLIN FLON
WINNIPEG
Jewish

Circles indicate population categories of all incorporated centres over 1000

354069
20598
5000 – 10000
2000 – 5000
1000 – 2000

DBS Census 1951

20 0 20 40 60
Miles

F

Relative Importance of Major Ethnic Groups by Municipality
(exclusive of all centres over 1000)

	Majority[1]	Plurality[2]
British		
French		
German		
Mennonite		
Scandinavian		
Ukranian		

▪ Hutterite colony
• Mennonite agri-cultural village

1. *over 50 percent of the total population*
2. *under 50 percent of the total population but largest group*

20 0 20 40 60
Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

UNIVERSITY LIBRARY

PART THREE

Resource Use

"Our link in the growing chain that binds nature to man's needs must be truly welded if those that follow are to meet the problems of their day".

— H. L. Keenleyside

The drama of resource production is the subject of Part Three. In a series of 58 maps the principal primary and secondary economic activities are examined against their physical and cultural setting. While it has been traditional among Manitobans to regard theirs as an agricultural province, diversity is inescapable in any survey of its economic activities. Agriculture still leads the primary economies, but manufacturing now accounts for over 60 percent of the gross income of the province. If we exclude "construction" as not indicative of the primary wealth of a region, the total gross value received from the primary industries and manufacturing was $1,159,396,265 in 1959.

Whereas agriculture has taken second place to the processing industries, its areal extent covering 13 percent of the province and its employed population exceeding manufacturing by nearly one-third, still gives it an undisputed place of major importance in the provincial economy. An analysis of this industry is set forth in 7 plates of 37 maps. Second of the primary activities is mining. Flin Flon, Lynn Lake and now Moak-Mystery Lakes are the major metal producers, balanced by the production of non-metallics especially petroleum in the southern part of the province (plate 29). Fourth among the provinces of Canada in developed hydro-electricity with its principal city, Winnipeg, enjoying rates lower than any other large city in Canada, Manitoba has much to offer power-based industries. Manitoba's forest industries are personified in Pine Falls, the largest pulp and paper plant in the Prairie Provinces. But with the construction of major hydro-power plants at Kelsey and Grand Rapids, notable expansion in this field is sure to follow (plate 28).

Although fishing is relatively small in value of production, it affords employment to more than 5,000 whose homes are scattered around the margins of our principal lakes (plate 30). While the time-honoured occupation of the fur-trade inaugurated commerce in this province, its place today has been taken by the other major economies.

The concluding maps set forth Winnipeg with half the population and 87 percent of the manufacturing. Manitoba's capital has regional significance reaching far beyond the borders of the province.

We in Manitoba are fortunate that the boundaries of our province encompass two natural regions of great wealth. Since 1870 we have been concerned mainly with one—the south. Its agricultural soils, unexcelled in fertility, have produced annually great harvests of grain that have gained a worthy reputation in the markets of the world. And from the south will continue to come the major share of the province's wealth. But we stand on the threshold of another region whose potential production is now only barely recognized. Here are power resources many times greater than those now developed in the province. Here is forest wealth, which if wisely used, will furnish pulp and paper mills for decades to come. Here is mineral wealth only now being developed, which rivals in prospect the greatest in Canada. Here are fisheries which already have made this province the second source of lake fish in Canada. Once the despair of the settler, the North is now Manitoba's heritage, a challenge to a new technology and an expanding economy.

TYPES of FARMING

Agricultural Area

Although agriculture is the first extractive industry by net value of production, the area of the province in farms is only 18 million acres or 13.2 percent of the total land area (135,536,000 ac.). Except for 44,000 acres in the Pasquia Valley west of The Pas, all commercial farming is confined to a triangular-shaped area extending from the 53rd parallel on the northwest to the International Boundary in the southeast (plate 18). Lying within the "agricultural triangle" is 2,400,000 acres of Federal and Provincial Forest Reserve.

There are very limited possibilities of future agricultural expansion under present methods of farming. Of the 7 million acres of clay soil in the "clay belt", an estimated 1,400,000 acres might be brought under cultivation, of which 173,000 acres lie along the Hudson Bay Railroad between Thicket Portage and Wabowden. Other possibilities, such as in the vicinity of Thompson, await mining development. The very extensive area east of The Pas (approximately 360,000 acres) for the most part will be under water when the Grand Rapids Dam is constructed (see text page 54). Except in the Interlake region, penetration into the fringe of settlement has long ago ceased, and a withdrawal from submarginal land continues (plate 14). The so-called "pioneer fringe" has long since lost its pioneer character, and might better be termed the "marginal fringe".

The outer limits of agriculture along the "fringe" are largely determined by the physical potentialities of the land. Economic opportunities in other activities has attracted many from submarginal farms, and except for an increased demand for pasture and hay land, the movement is one of gradual withdrawal. The outer boundary of agriculture as indicated on plate 18 is determined by a complex of both physical and economic factors. Climate, expressed through the frost-free season, will permit a further extension in some areas of the fringe, but poor soil, drainage, forests and stoniness mitigate against cultivation.

In the southeast, the short frost-free season, combined with coarse-textured, grey-wooded and bog soils discourages further penetration. However, along alluvial valleys such as the Whitemouth, dairying and cattle farming are well established. To the north of Pine Falls, a long frost-free period is favorable, but extensive areas of bog and swamp with some rock outcrop very definitely restrict agriculture beyond the Winnipeg River. Both the Westlake and Interlake have experienced some frontier activity with renewed interest in beef cattle. Much of the land is marshy, but some has value for wild hay and pasture. Limitations of soil in particular, are most difficult to overcome along the fringe of agricultural settlement. (See Rendzina Soil, page 12).

Within the agricultural triangle, variations in farming type are closely related to soils, elevation, growing season, drainage and topography as well as to markets and ethnic background. The economic aspects of farming introduce the element of change into the farming types pattern. The ratio of acres of farmland to population in Manitoba is of the order of 12 to 1. However, the actual needs of the population are more nearly 3 to 1. For this reason, three-quarters of the farm produce must be exported, which indeed has given to Manitoba the character of an agricultural province. Wheat has always been (and still is) the most important export commodity, although local processing plants are stimulating diversity of agriculture products. Added to this, the rapid growth of Winnipeg with half the province's population has so stimulated the demand for dairy and livestock products that the trend over the years has been toward diversification in areas within daily reach of the city. Today's trend in farm economy is toward increased capitalization of the farm by mechanization and consolidation of small holdings. This has enlivened competition and tended to eliminate marginal farms.

Ethnic background also plays a notable part in diversity of farming types. The best example is the Mennonite farmer who in the face of expanding farm population, has intensified farm practices turning to poultry and milk production in some districts, and to special crops in others. Most diversification has taken place in the Red River plain, partly by reason of the Winnipeg market, and partly the result of increased local processing plants (pages 44 and 46).

Farm Types

Farm income as reported by municipality in the 1951 census constitutes the criteria for the divisions presented in the Types of Farming map (plate 18). A revision was made on the basis of acreage in crops in 1956 and on the experience of field men in the Provincial Department of Agriculture. The categories set forth were arbitrarily defined so that the boundaries between types should not necessarily be taken as indicating abrupt change. Based on 1956 Census data, a variety of statistical analysis was made and set forth in tables following the text. The following definitions were used to define the eight types outlined on the map.

Livestock Specialty Areas[1]

70 percent or more of the gross farm revenue was received from sales of livestock and livestock products.

1. Dairying—dairy products more than 40 percent of total sales of livestock and its products.
2. Beef Raising—cattle sales over 40 percent of total sales of livestock and livestock products.

Grain Specialty Areas

70 percent or more of gross farm revenue from sale of grain and hay.

3. Mixed Grain—no single crop exceeds 40 percent of total crop acreage.
4. Wheat—wheat acreage exceeds 40 percent of total crop acreage.

Cash Crop-Livestock Combination

less than 70 percent of gross revenue from *either* crops or livestock.

5. Cash Crop Emphasis—gross revenue from crops exceeds livestock.
6. Livestock Emphasis—gross revenue from livestock exceeds crops.

Special Crops

7. Canning and Processing Crops—two areas, the Pembina Triangle and Portage Plains, are sufficiently specialized.
8. Market Gardening—vegetable crops in vicinity of Winnipeg.

[1]Lane, G. A., and Carson J. G., Agricultural Statistics by Types of Farming Areas, Manitoba; Can. Dept. of Agriculture, Econ. Div., Ottawa, April 1956. Pub. 56/15.

Livestock Products

1. *Dairying*—Dairying as a speciality is confined to three areas in eastern Manitoba. The vicinity of Winnipeg is the oldest with the obvious reason being the demand of the Winnipeg market. To the southeast, centred on La Broquerie and Grunthal, is the largest dairying area with daily shipments to Winnipeg and locally to powdered milk and cheese plants. To the south and east of Steinbach the land is stony and poorly drained reducing cropping and favoring pastoral use. This is reflected in the large amount of unimproved land and wooded pasture (see tables). To the north and west of Steinbach, the soils and drainage improve. Increasing numbers of poultry and hogs indicate a trend on the part of some from dairying to livestock. Mennonite farmers predominate although French and Ukrainians are well represented. The northern dairy area, smallest of the three, ships milk daily to Winnipeg. This, in common with the hay raising areas around it, depends on natural meadows to a greater degree than the areas to the south.

2. *Beef Raising*—Two beef specialty areas are indicated: in the southeast and in the Interlake-Westlake districts tributary to Lake Manitoba. Soils and drainage render the land unfavorable for cultivation, but large areas have wild hay meadows and much is wooded. Population densities are low and tenancy increases, largely because farmers prefer to lease grazing land from the government. The predominant ethnic group in the southern area is Ukrainian but in the Interlake, Scandinavian, French (St. Laurent) and British are all represented. While farm numbers are small, farm units are large (500 to 600 acres) with a noticeable trend to increasing size. Improved land per farm is lower here than any other part of the province being less than a third of the area. Oats is the preferred crop along with tame hay. While beef cattle outnumber all other kinds of livestock, dairy cattle are considerable along with sheep and horses. The marginal character of the farms is indicated by the low value of machinery per farm and per acre (plate 23).

Grain Specialty

The grain specialty areas are those in which more than 70 percent of the farm income is derived from the sale of grains. Two subdivisions are recognized: (1) where more than 40 percent of the *area* is in mixed grain and (2) where more than 40 percent of the *area* is in wheat.

In general those areas having favorable soil, topography and climate for grains, especially wheat, are devoted to this specialty. Livestock with the exception of beef cattle, are noticeably "light" in these areas. In contrast to the beef specialty and dairy areas, this type is best developed in the southwest.

3. *Mixed Grain*—Wheat, oats, barley, flax and small amounts of rye are the principal mixed grains. The distribution of each grain is mapped on plate 20 (see also graph, page 80).

In the "mixed grain" area of the Red River valley and its extension westward onto the upland, wheat is preferred on soils that grade from fine textured clays to medium texture Black soils. The landscape is rolling along the southern edge of the Pembina-Tiger hills. Tenancy is high. The Red River plain is rated excellent to good for wheat, but flax, barley and oats are well represented. The areas in Swan River valley, and from Minnedosa to Russell specialize in malting barley favoured by a cooler climate and lower protein content. The Dauphin plain has a fairly even balance in acreage devoted to the principal grains. In the southwest wheat is preferred along with flax and feed barley.

4. *Wheat*—The southwest stands out as the major area of specialized wheat raising. Farm sizes are large; value of machinery and gross income per farm reach a maximum (plate 23). So also is the percent of tenancy and of non-resident operators (plate 24).

The region of wheat specialization southwest of Winnipeg (MacDonald Municipality) was last to be settled in the valley, owing to poor drainage. Holdings were large and mechanization soon followed. The Neepawa and Rivers areas grow wheat on the undulating till plain on medium textured Black soils.

Cash Crop-Livestock Areas

Those farms whose revenue is derived from both crops and livestock are commonly called "mixed farms". Neither crops nor livestock contributes alone as much as 70 percent of the gross farm income. This farm type is found on land which is not optimum for grain growing. Frequently it is a soil problem; sometimes topography or drainage renders it unfavourable for tillage. Farmers usually crop the land suited to cultivation and utilize the remainder for grazing purposes.

5. *Cash Crop Emphasis*—Of the eight types indicated on plate 18, a combination of crops and livestock with emphasis on the former has the widest distribution in Manitoba. Such farms do not have as high a gross income as the grain specialty farms, but the source of income is more diversified and accordingly more uniform. Distribution of this type is intermediate in location between livestock specialty areas and grain specialty areas. On the mixed farm oats tends to be more important than wheat or barley varying with the district. Barley for feed exceeds oats in districts where hogs are important (plate 21).

6. *Livestock Emphasis*—Those areas of mixed farming indicated on the map as "livestock", are inferior for grain growing, with the exception of the Riverton district north of Gimli. Along the margin of the agricultural triangle, drainage is an increasing problem, especially in the Westlake district, and soils are either high-lime, Grey Wooded or podzolic. In the extreme western area, much of the land is broken by "potholes" or sloughs, or is rough, and in the vicinity of Oak Lake is sandy and droughty. Adjacent to the Spruce Woods Reserve (Brandon-Carberry), much of the soil is too coarse textured for cultivation. Notwithstanding, over half the average farm is in crops, oats being preferred slightly over wheat.

Special Crops Areas

Those crops produced for local processing plants referred to as "special crops" (7), and vegetable crops produced within 25 miles of Winnipeg (8) are described on page 44. While these crops are indicative of a trend to intensification (plate 18), wheat, oats and barley are raised on mixed farms in the same districts, and on most farms they are only part of a diversified cropping program.

TABLE I—Farm Population and Tenure

Farm Type	Persons per Farm (Average)	Percentage of Operators		
		Non-resident	Owner	Tenant
Livestock Specialty				
1. Dairying	5.3	5.9	83.4	4.2
2. Beef Raising	4.3	6.6	68.4	3.7
Grain Specialty				
3. Mixed Grains	4.3	12.3	61.9	11.3
4. Wheat	3.9	9.9	44.4	18.3
Combination				
5. Cash Crop Emphasis	4.8	7.0	68.9	9.8
6. Livestock Emphasis	4.0	18.4	77.8	4.3
7. Special Crops	4.7	8.1	63.4	7.5

TABLE II—Percentage of Total Farms by Size Categories (Acres)

Type No.	Total Number of Farms	Below 9 acres	10–69	70–239	240–399	400–559	560–759	760–1599	1600–2800
1	2,347	11.1	14.7	39.91	19.3	7.7	3.6	3.2	0.5
2	2,268	0.6	2.2	36.8	30.0	13.7	7.3	7.8	1.6
3	10,303	1.6	3.6	20.8	32.9	20.1	14.1	6.5	0.4
4	3,389	0.7	1.7	12.0	30.9	23.8	15.9	14.1	0.9
5	20,507	2.4	6.9	26.9	30.6	16.4	9.8	6.4	0.6
6	7,053	0.9	3.7	38.4	28.9	13.5	7.7	6.1	0.8
7	1,580	10.0	25.1	38.4	18.7	4.8	1.7	1.1	0.2

TABLE III—Average Farm Size and Principal Use of Farm Land (Acres and Percent)

Type No.	Average Farm Size	Area Owned		Area of Improved Land		Area Under Crops		Area Under Summerfallow		Area Under Pasture		Area in Woodland		Type No.
		Acres	As Percent of Farm	Acres	As Percent of Farm	Acres	Percent of Improved Land	Acres	Percent of Improved Land	Acres	Percent of Improved Land	Acres	Percent of Unimproved Land	
1	244.8	209.6	85.6	107.4	43.9	77.9	72.6	14.9	13.9	9.6	8.9	53.6	60.9	1
2	385.3	290.9	75.5	103.5	26.9	61.0	56.8	11.9	11.5	17.7	17.1	105.1	38.1	2
3	446.1	390.1	87.3	347.3	77.9	223.3	64.3	89.9	25.8	11.0	6.9	19.8	16.0	3
4	487.2	325.5	66.8	369.3	75.8	245.1	66.4	111.9	30.3	10.3	2.8	22.0	17.2	4
5	374.4	324.0	86.5	258.0	68.9	157.5	61.0	73.6	28.5	14.7	3.4	30.8	26.7	5
6	338.7	284.5	84.0	209.0	61.7	117.5	56.2	36.4	19.3	29.3	14.0	36.7	24.7	6
7	167.1	128.6	76.6	161.8	96.8	128.4	79.3	21.5	13.3	6.2	3.8	0.5	9.2	7

TABLE IV—Field Crops as Percentages of Total Area Under Crops for Each Type of Farming Area

Farm Type	Wheat	Oats	Barley	Rye	Flax	Mixed Grain	Tame Hay	Corn	Other Fodder	Potatoes
Livestock Specialty										
1. Dairying (182,979 acres)[a]	12.0	35.1	13.7	0.3	3.7	6.5	20.6	1.1	1.5	0.7
2. Beef Raising (138,346 acres)[a]	7.2	39.9	10.5	0.4	1.6	0.7	24.8	0.2	1.0	0.6
Grain Specialty										
3. Mixed Grains (2,299,744 acres)[a]	30.1	21.9	20.7	1.1	10.7	0.5	4.6	0.2	0.9	0.8
4. Wheat (830,528 acres)[a]	40.0	16.6	16.7	1.1	16.4	0.3	3.2	0.1	0.3	0.1
Combination										
5. Cash Crops Emphasis (3,230,318 acres)[a]	26.1	27.5	22.8	0.6	8.9	3.5	9.1	0.3	0.9	0.3
6. Livestock Emphasis (828,590 acres)[a]	23.2	28.4	17.5	0.7	5.9	0.8	22.0	0.3	0.9	0.1
7. Special Crops (215,485 acres)[a]	20.7	22.2	19.8	0.2	22.5	0.5	2.6	0.2	0.6	0.6

[a] Figures in brackets indicate total area under crops.

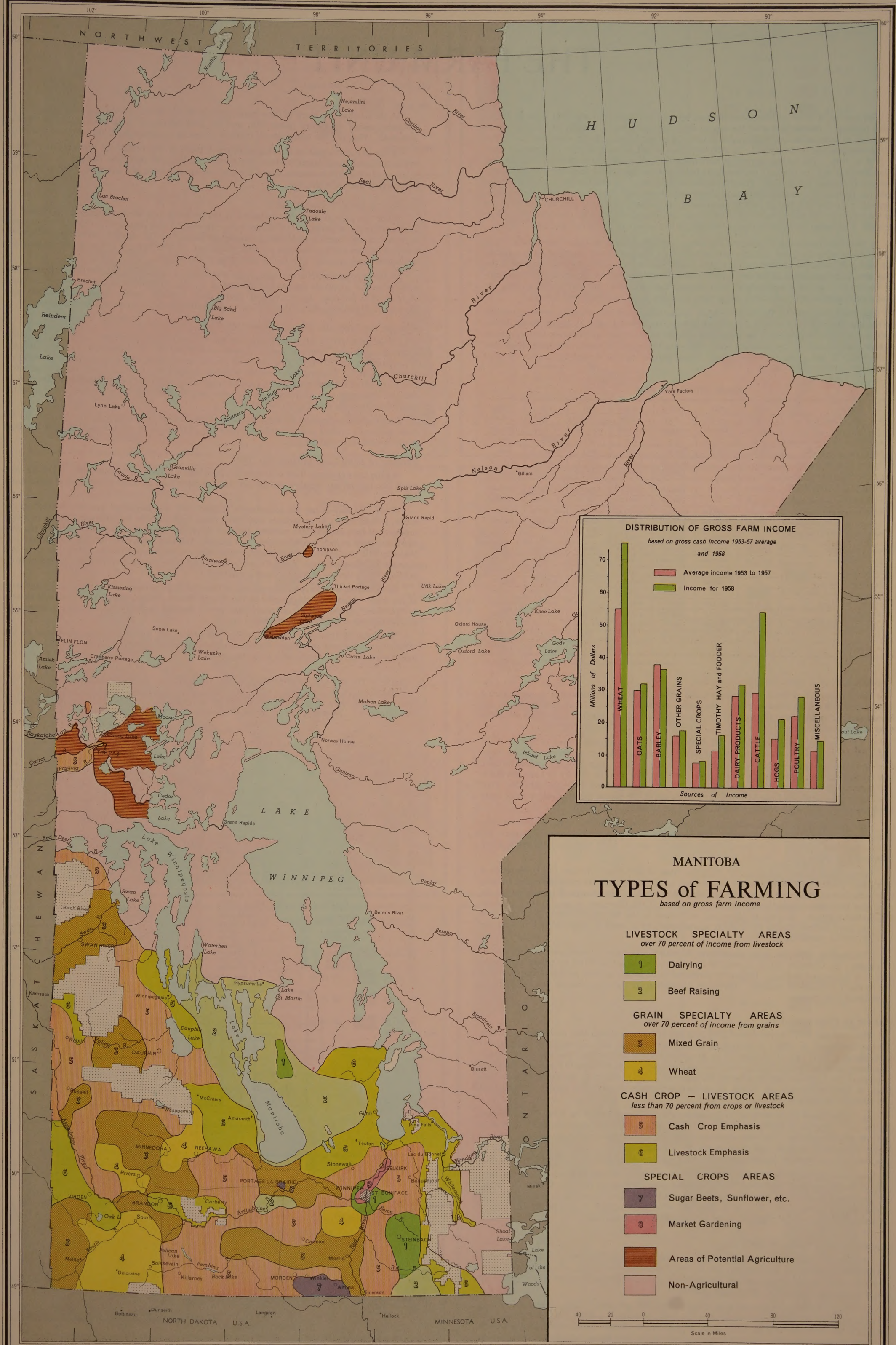
TABLE V—Numbers of Livestock Per 10,000 Acres of Farmland

Type No.	Horses	Total Cattle	Milking Cows	Sheep	Pigs	Poultry
1	48	627	270	59	298	9,215
2	63	727	214	85	54	1,163
3	32	361	75	23	730	2,833
4	35	447	78	16	135	2,109
5	42	479	136	38	542	3,469
6	65	500	137	66	123	4,035
7	23	328	157	17	375	12,137

TABLE VI—Percentage of Total Farms Having Farm Equipment of Various Kinds

Type No.	Automobiles	Motor Trucks	Two Tractors	Gasoline Engines	Grain Combines	Electric Power
1	63.0	55.5	93.3[b]	25.6	17.0	90.4
2	46.1	40.9	79.9[b]	34.8	2.4	74.3
3	73.5	67.6	17.0	68.1	62.4	86.7
4	77.8	70.3	37.7	70.5	67.0	70.5
5	66.3	57.4	12.1	48.6	43.9	85.5
6	58.7	48.8	11.6	30.1	27.6	81.4
7	74.8	70.6	28.8	40.8	42.2	92.9

[b] Percentage of the total farms having *one* tractor.



DISTRIBUTION OF GROSS FARM INCOME

based on gross cash income 1953-57 average and 1958

MANITOBA

TYPES of FARMING

based on gross farm income

LIVESTOCK SPECIALTY AREAS
over 70 percent of income from livestock

1 Dairying

2 Beef Raising

GRAIN SPECIALTY AREAS
over 70 percent of income from grains

3 Mixed Grain

4 Wheat

CASH CROP — LIVESTOCK AREAS
less than 70 percent from crops or livestock

5 Cash Crop Emphasis

6 Livestock Emphasis

SPECIAL CROPS AREAS

7 Sugar Beets, Sunflower, etc.

8 Market Gardening

Areas of Potential Agriculture

Non-Agricultural

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

THE FARM UNIT

The number of farms in Manitoba increased between the years 1901 and 1941 from 32,252 to 58,024 holdings. During and after the second world war a decline in number of holdings set in occasioned by more attractive employment in industry or participation in the armed services. The decline has continued to the present. In 1956 there were 49,201 farms, a decrease of 15 percent from the peak of 1941. The notable increase in farm machinery, the continued attraction of city life and higher earnings and the tendency to consolidate holdings to secure a more economic unit are fundamental in explaining this decline. To some degree the problem of the small farmer in obtaining farm credit has hastened the exodus from marginal units and thus stimulated the trend to larger holdings. Decrease in number of farms may not be explained by an absolute decrease in area farmed, for in the last census the area in farms reached 17,931,817 acres, an increase of 1,045,495 acres since 1941. It is, therefore, a sustained movement toward consolidation and growth in size of the farm unit.

In 1901 the average size of farm was 274 acres compared to 365 acres today, an increase of one third. Along with the trend to larger holdings has been the increase of improved land including crop land, cultivated pasture and summerfallow. Improved land now accounts for 64 percent of the total farm land compared to 52 percent in 1941. Unimproved farm land has experienced a corresponding shrinkage. Not only is woodland being cleared and cultivated, but certain areas along the frontier have become improved cattle farms, thereby adding to the total improved acreage.

The statistical units for the maps on plate 19 and subsequent pages dealing with agriculture are the municipality and the local government district, the smallest units by which census data is made available. The purpose of the maps is to indicate trends within specific areas of the province in those factors related to the farm as a unit. For identification of the names of municipalities refer to the Index to Rural Municipalities below. Municipalities may be located by number on maps appearing on plates 19, 22, 23, 24.

FARMS AND FARM AREAS

Item	1901	1911	1921	1931	1941	1951	1956
Total Number of Farms	32,252	43,631	53,252	54,199	58,024	52,383	49,201
Area in Farms (acres)	8,843,347	12,184,304	14,615,844	15,131,685	16,891,322	17,730,393	17,931,817
Percentage of total area in farms	21.5	29.6	10.8	11.2	12.5	13.1	13.2
Average area per farm (acres)	274.2	279.3	274.5	279.2	291.1	338.5	364.5
Area operated by owner (acres)	—	—	10,799,431	9,064,093	9,251,725	10,535,678	10,111,232
Area operated by tenant (acres)	—	—	1,956,575	2,884,682	3,424,526	1,784,152	1,618,172
Area operated by part owner, part tenant (acres)	—	—	1,581,856	2,974,227	4,043,659	4,989,478	5,769,755
Area operated by manager (acres)	—	—	262,196	208,683	171,412	421,085	432,658
Total area operated by owner (acres)	8,073,894	10,290,538	12,006,671	10,917,126	11,608,541	13,788,328	13,818,460
Total area operated by tenant (acres)	769,453	1,893,766	2,609,173	4,214,559	5,282,781	3,942,065	4,113,357
Percentage of farm land operated by owner	91.3	84.5	82.1	72.1	68.7	77.8	77.1
Improved Land (acres)	3,995,305	6,746,169	8,057,823	8,521,930	9,829,174	10,761,810	11,453,783
Under crops (acres)	2,761,309	5,182,309	5,858,683	5,846,030	6,327,967	7,335,184	7,686,013
Pasture (acres)	—	—	417,329	411,924	455,487	584,722	594,902
Summer fallow (acres)	—	938,788	1,642,021	2,069,944	2,767,335	2,519,264	2,827,551
Other improved land (acres)	—	—	139,790	194,032	278,385	322,640	345,317
Unimproved Land (acres)	4,848,042	5,438,135	6,558,021	6,609,755	7,062,148	6,968,583	6,478,034
Woodland (acres)	258,729	497,547	1,889,363	2,018,520	1,529,648	1,812,209	1,566,494
Other unimproved land (acres)	4,589,313	4,940,588	4,668,658	4,591,235	5,532,500	5,156,374	4,911,540
Tractors	—	—	10,027	14,366	22,050	50,984	59,265
Grain Combines	—	—	—	355	1,714	15,268	21,425

Source: Census of Canada 1956, Agriculture, Manitoba, Bulletin: 2-7

Average Size of Farms (19A)

The average size of farms in Manitoba is 365 acres. Half the area farmed is in units ranging in size from 400 to 640 acres or more. The largest farms are in Ellice Municipality (90) on the Saskatchewan border where the average farm exceeds 1,000 acres. About a quarter of the farms vary from 320 to 400 acres.

A block of very large farms, over 560 acres, occupies the southwest corner of the province. Units decrease in size progressively north and east of this corner, although in general the large farms of the province are in the western and central areas. Conditions for large scale mechanized farming and crop production, especially wheat, are most favorable here. In the vicinity of Lake Manitoba and also the Spruce Woods Forest Reserve, large holdings based on beef cattle are the rule. Poor drainage in the vicinity of Lake Manitoba and sandy soil in the Spruce Woods Reserve make these lands less desirable for crop production but adequate for extensive cattle raising.

The Municipality of La Broquerie (16) southeast of Steinbach stands out as having substantially larger farms than the surrounding area. This is the heart of the province's dairy belt (plate 18) where stony soil, unsuited for cropping has been used to sustain dairy cattle on large units of low value per acre (plate 22D). See also plate 21.

Smaller-sized farms occur generally along the fringe of settlement. In part this is the result of Ukrainian, French and Mennonite settlement with a definite tendency to carry on mixed farming and in the case of the latter two, to keep their sons on the land. In some sections, particularly in the southeast, part-time farming in combination with fishing (Lake Winnipeg) or wood-cutting, explains the smaller holdings. In areas of Mennonite settlement in the Red River Valley (plate 17) farm holdings have become smaller by division, accompanied by a trend to intensification of land use through raising special crops.

The smallest farms are those specializing in market gardening in municipalities tributary to Winnipeg. St. Clements (74) is unusual in that the northern part is settled by people engaged in part-time fishing and farming. Urban encroachment on rural land in these bordering municipalities has favored division of holdings. Part-time occupation in the city enables small holders to supplement their income.

Change in Farm Size (19B)

This map sets forth the percentage growth in size of farm units from 1941 (reflecting immediate pre-war conditions) to 1956. In general the area of large farms in the southwest and south central parts shows a lower rate of increase (10 to 20 percent) partly because the base was already large. The fringe areas fall within the intermediate range while the lands adjacent to Lake Manitoba and in much of the Interlake area record a notable increase. This is related to the strong trend to livestock in these areas and the ability of modern equipment to clear the lightly forested land characteristic of much of the area.

As a reflection of the trend to a more economic unit the farms around the Spruce Woods Forest Reserve, to the south of Riding Mountain and north of Agassiz Forest Reserve, show increases of 40 to 60 percent and over. Farm abandonment in these areas has also occurred for economic reasons. Rough topography or sandy soil mitigate against farming, except on a large scale, in these areas. The increase in mechanized farming (plate 23A) accounts for the general trend to larger units.

Only two very small municipalities show a decrease in farm size. St. Francois Xavier (52) with a large French-speaking population has experienced some division of the land within the family and because of proximity to Winnipeg owners of small holdings have been able to supplement their income with part-time work In East St. Paul (47) urban encroachment and intensification of land use through specializing in vegetable crops accounts for a small decrease.

Change in Farm Numbers (19C)

Between the years 1941 and 1956 the number of farms declined from 58,024 to 49,201. Out of 115 divisions indicated on the map only five showed a small increase. This province-wide trend to fewer farms may be explained in part by the abandonment of submarginal land but a more important reason is the consolidation of small holdings (plate19B).

The trend to fewer farms is far from uniform over the province. Those areas experiencing the greatest percentage change are mostly along the fringe of settlement where soil and other physical conditions are generally poor for most types of agriculture. Much abandonment of uneconomic holdings has occurred in these areas, particularly east of the Red River, between the lakes, in the vicinity of the Spruce Woods Forest Reserve, south and west of Riding Mountain and east of Duck Mountain (flooding).

In the southwest a block of three municipalities stands apart. Here decrease is related to the increasing use of machinery (plate 23A) and the consolidation of farm holdings mainly through lease-hold. West of Lake Manitoba the decrease in numbers may also be attributed to consolidation.

Of the five municipalities showing an increase, those in the vicinity of Winnipeg have experienced the break-up of larger holdings into market gardens and part-time farms. In the municipality of Stanley (10) increasing use of the land for special crops has led to intensification and a reduction in the size of the unit.

Change in Area in Farms (19D)

While the area in farms has increased in the province as a whole since 1941, in general the increases have been moderate (1 to 12 percent). However in the vicinity of the large lakes increases in farm area have been much higher (12 to over 50 percent). The clearing and draining of land for livestock pasture and hay has been the principal reason. The bringing of new land into use along the settlement fringe accounts for a higher percentage in those areas.

At the same time notable decreases in the area farmed is apparent in the southeast following land abandonment. Moderate decreases to the west of the Red River relate in part to the expropriation of farm land for road allowances and double-ditch drainage canals. The municipalities near Winnipeg and Brandon show a decrease due to the encroachment of urban uses on rural land.

Percent of Farmland Under Crops (19E)

Of the total land in farms in the province nearly two-thirds is "improved". Of this, two-thirds is in crops, a little less than one-quarter in summerfallow and the rest in improved pasture. Summerfallow is widely used in the province, more for the purpose of controlling weed growth than conservation of moisture. The practice increases, however, towards the drier southwest to approximately thirty percent of the improved land. Land in crops is highest in the Red River plain where climate, soil and topography are optimum. At the same time the need for summerfallow is less since the heavy-textured soils are moisture retentive.

The correlation between livestock specialty areas and low percentages of land in crops is very close, especially around Lake Manitoba. Here the emphasis is on natural pastures and hay land found around lakes and sloughs.

Percent of Farm Land Unimproved (19F)

A little more than one-third of Manitoba's farm land is classed as "unimproved". This includes wood lots, natural hay meadow and pasture, besides waste land unsuited to any kind of agricultural use.

While this map is not the complement of plate 19E (summerfallow was not included in the latter) it does reflect in an indirect way those areas most suitable for cropping. Areas in which unimproved land exceeds fifty percent nearly all lie on the fringe of settlement. Adverse physical conditions such as rock outcrops, sandy and gravelly soil, peat bogs, close forest stands, marsh and Podzolic soils to a greater or less degree render improvements impracticable. Some farms in this zone are submarginal, some are part-time holdings and many in the Interlake are extensive cattle holdings where the use of wild hayland is essential.

Several areas with forty to fifty percent of their holdings unimproved lie in the centre and west of the map. Sand dune topography of the Spruce Woods section, the high incidence of sloughs or "potholes" on the western boundary, and poorly drained swales in the Westlake area may be cited as adverse conditions for cropping.

Networks of drainage canals, uniformly productive soil, flat topography, proximity to the Winnipeg market and progressive farming methods make the Red River plain the area with the lowest percentage of unimproved land in the province.

INDEX TO RURAL MUNICIPALITIES AND LOCAL GOVERNMENT DISTRICTS

(Excluding Greater Winnipeg which includes the suburban municipalities of Fort Garry, St. Vital, North Kildonan, West Kildonan and Transcona and the cities of St. Boniface, St. James, East Kildonan and Winnipeg.) Numbers will aid in the location of municipalities on maps plates 19, 22, 23, 24.

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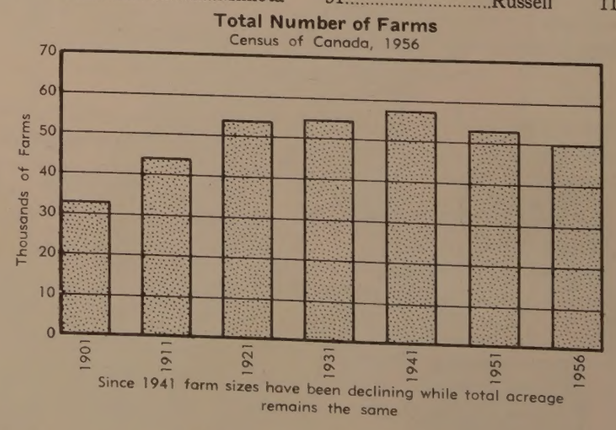
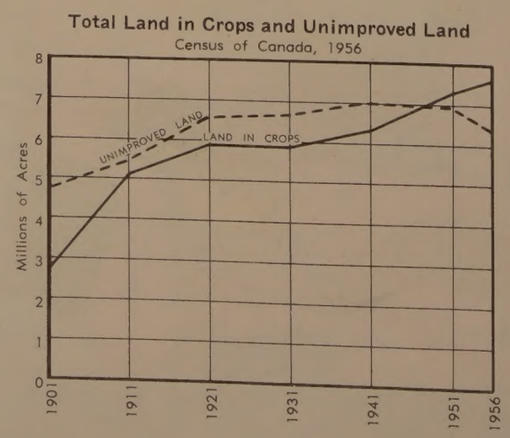
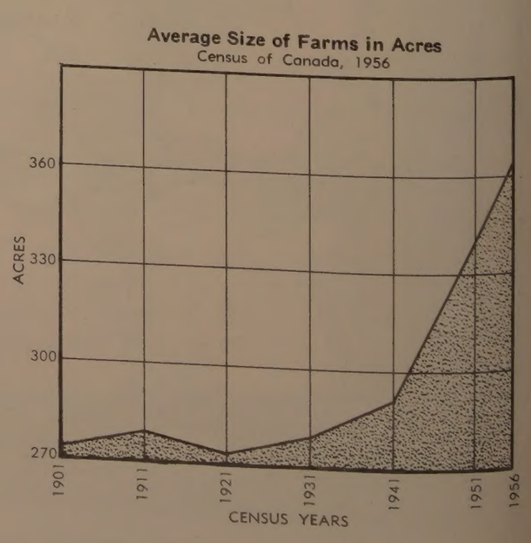






A

AVERAGE SIZE of FARMS
in acres

- under 160
- 160 to 240
- 240 to 320
- 320 to 400
- 400 to 480
- 480 to 560
- 560 and over

DBS Census 1956

20 0 20 40 60 Miles

B

PERCENT CHANGE in FARM SIZE
1941 — 1956

Percent Increase
- 0 to 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 to 50
- 50 to 60

Percent Decrease
- 0 to −5

DBS Census

20 0 20 40 60 Miles

C

PERCENT CHANGE
in FARM NUMBERS 1941 — 1956

Percent Increase
- 0 to 10

Percent Decrease
- 0 to −5
- −5 to −10
- −10 to −15
- −15 to −20
- −20 to −30
- −30 and over

DBS Census

20 0 20 40 60 Miles

D

PERCENT CHANGE in AREA
in FARMS 1941 — 1956

Percent Increase
- 0 to 3
- 3 to 12
- 12 to 25
- 25 to 50
- over 50

Percent Decrease
- 0 to −3
- −3 to −12
- −12 to −25

DBS Census

20 0 20 40 60 Miles

E

PERCENT of FARM LAND
under CROPS

- 0 to 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 to 50
- 50 to 60
- 60 to 70
- 70 to 80

DBS Census 1956

20 0 20 40 60 Miles

F

PERCENT of FARM LAND
UNIMPROVED

- 0 to 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 to 50
- 50 to 60
- 60 to 70
- 70 and over

DBS Census 1956

20 0 20 40 60 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

CROPS

Field crops constitute the most important use of agricultural land in Manitoba. Out of 18 million acres of farm land in the province, 7.5 million acres (41 percent) is planted to field crops. If we add an additional 3 million acres in fallow the total *cultivated* land comprises 58 percent of the farm land. Nor is acreage alone the measure of the relative importance of crops to Manitoba agriculture. Out of a gross return of $321,000,000 in 1959 from all branches of agricultural production, $175,000,000 or 54 percent was derived from the sale of field crops. The value of field crops varies appreciably from year to year depending on the amount of land cultivated, seasonal variation in growing and harvesting conditions, the availability of markets and the price. Grain crops collectively accounted for $146.5 million or 83 percent of the value of all crops in 1959, and in the same year occupied 87 percent of the land planted in crops. The balance was devoted largely to hay and vegetables (see graph page 80).

Crop Trends

The relative importance of the principal crops, based on acreage, since 1886 is shown on the graph page 50. From 1901 the highly preferred place of wheat (68 percent of all crop acreage) began to decline, its place being taken chiefly by barley. In many respects the distribution of wheat and barley largely complement each other. However, decreasing yields have reduced barley acreage since 1955 and wheat has been in the ascendency, particularly since rust-resisting Selkirk wheat was made available. Oat acreage has shown a remarkable stability over the years; even the rapidly disappearing horse has not appreciably affected acreage. Increasing cattle numbers have helped to offset the decline in horses. Flax has fluctuated markedly since 1949, but remains popular in the southern part of the province. Rye has a relatively small acreage. Such forage crops as grasses, clover and alfalfa have gained an increased place since 1941, while special crops (sunflower, rape seed, soybeans and sugar beets) are locally important but small in total acreage. A fallow-grain system is still the dominant type of land use in Manitoba. The proportion of fallow to cultivated acreage reached a high point in 1959 with 27 percent of the total cultivated land in fallow.

Crop Location

The distribution of the four most important grain crops in the province, based on value and acreage, is shown in the first four maps, plate 20. The distribution and concentration of these crops on an acreage basis is indicated by dot patterns, while the preference for certain crops by municipal divisions is indicated in color. In most cases areas of greatest concentration of a particular crop correlate with areas of high preference, unless physical conditions are not optimum for its growth. This is illustrated in the case of oats which is the preferred crop on both sides of Lake Manitoba and yet the acreage sown is less than in more favourable areas to the south.

The choice of crops to be grown on each farm and in each district rests, of course, with the farmer. But long years of trail and error, together with scientific research into conditions and methods optimum for growth largely guide most farmers today. The factors of crop location fall into two groups. The physical factors of topography, soil and climate set certain limits on the production of a given crop and to some degree on the methods of production. For example, in areas of high summer temperatures and low rainfall oats does not thrive; whereas in areas of moist, cool conditions and even on slightly acid soils it does much better. Again, where the land is broken by erosion channels, or pitted with sloughs, it is more difficult to farm it extensively with large scale machinery and land in crops gives way to pasture.

But the physical factors are in many respects secondary to the human and economic factors. Manitoba in common with the other Prairie Provinces is keenly affected by world markets. Surpluses have created disposal problems for wheat and resulted in production quotas being imposed. This in turn has led to the favouring of barley on many farms, especially on the plain south of Riding Mountain. Of significance, too, is the type of farm. The mixed farmer is concerned with producing a variety of crops, some for cash sale, some for livestock feed. His choices therefore will be governed by market prices for livestock, eggs and poultry as well as the cash grain market. To some extent the cultural background of certain ethnic groups is important in crop production. The immigrant from Eastern Europe was mainly a mixed farmer, and his settlements along the fringe of agriculture reflect this system of land use to the present. The Mennonite, never a cattle farmer, specializes in crop production. The Metis farmer looks more to subsistence farming than the grain grower in the southwest.

Wheat

Much of the agricultural history of Manitoba has been connected with one dominant crop, wheat. While it has declined in relative importance over the years, its position is still unchallenged as the following table shows (see graph page 50).

Average Acreages of Principal Crops (1949-1959)

CROP	Acres	Percent
Wheat	2,311,000	36.4
Barley	1,860,273	29.3
Oats	1,643,727	25.9
Flax	535,000	8.4
Total Crops (above)	6,350,000	100.0

In 1959 nearly two-fifths of all acreage in grains was wheat and the return from wheat was $70.8 million or 48 percent by value of all grain crops. Southwestern Manitoba shares with the southern prairie region a climate, soil and topography favourable for the production of a high protein spring wheat. The success of the west as a wheat growing region became possible with new varieties better adapted to the environment. First came Red Fife, originally from the Russian steppe though introduced through Ontario. Through its use, "Manitoba No. 1 Hard" became the standard of excellence on the world's wheat markets. Cereal research has led to the introduction of shorter maturing varieties and rust-resistant strains, notably Selkirk wheat. Factors of soil, climate and topography affect wheat distribution, as well as the market price. Generally, a high protein wheat grows best on medium-textured, clay loam soils (Shallow Black soils), where the frost free season is 100 days or more, where a wet spring (7 to 9 in. rainfall) is followed by a warm, moderately dry summer, and where terrain is flat and unbroken to permit the use of large-scale machinery. The distribution in Manitoba is controlled by the average frost free line of 100 days (plate 7), although some is grown where the average is between 90 and 100 days, but not without risk. It will be noticed from plate 20A, that wheat is grown to some extent over most of the agricultural land of the province. Nevertheless in some districts it is quite concentrated and is the preferred crop. The Red River plain is the highest-producing region of the province accounting for 30 percent of the acreage. Here, climatic conditions are favourable although in some areas the heavy, poorly drained soils are only fair for wheat. However, its greater tolerance of a poorly drained soil makes it preferred over barley in the municipalities south and west of Winnipeg. Here farms are large and mechanization came early, chiefly because settlement on the inadequately drained lands was late. Moreover, livestock was never popular, as the wet pastures suffer damage and well-water proved to be saline. The Mennonite farmers were traditionally (and initially) wheat farmers, although the division of holdings into smaller units and the higher return per acre from special crops has seen a decrease in wheat acreage in the south. A band of wheat concentration extends west of Morris following the medium-textured Black soils south of Pembina hills and is markedly concentrated in a broad zone southeast of the Souris Valley. In the Boissevain (Waskada) till plain, wheat is dominant on the Shallow Black soils. With high evaporation rates (plate 9) and greater moisture deficit these soils are inclined to be droughty but on the whole they are good to excellent for wheat. Yields are somewhat lower (18 to 20 bushels per acre) but the protein content is highest in the province. The preference for wheat extends northward from this zone to the vicinity of Brandon where it spreads into a broad zone north of the Assiniboine River from Neepawa to the Saskatchewan boundary. While yields improve as we go northward, protein content declines, and malting barley gradually replaces wheat closer to Riding Mountain. In the Dauphin plain, a longer growing season favours wheat, but in Swan River Valley, the danger of fall frost is a hazard. Conspicuous areas of light concentration are related to coarse-textured soils in the Souris basin (Sifton 30), and the upper and lower delta of the Assiniboine River. Whereas distribution of wheat may be accounted for partly on the basis of favourable physical factors, farming type is also an important aspect of crop preference.

Barley

Of growing significance in the crop pattern, barley ranks second to wheat in both acreage and value. This is largely in response to local market demand and the adaptability of the crop to Manitoba conditions. Two distinct varieties are grown in Manitoba: a low protein, high starch variety for use in malting, and a higher protein barley for use as livestock feed. The demand for the former has been very steady in recent years and a premium price is paid. Manitoba produces half the Canadian malting barley. Recently a demand in Japan for pearling barley has opened an overseas market. Barley is an early maturing, high yielding crop that grows well under cool moist conditions. It demands a better drained soil than wheat or oats and is not tolerant of soil alkalinity. These growth factors largely affect its concentration, especially the malting variety. It shares with oats a high concentration along the northern margin of the agricultural zone. Two areas of marked concentration are south and west of Riding Mountain, and the Swan River Valley where conditions are excellent for the malting variety. Barley for feed has a wider and more uniform distribution, correlating with livestock-producing districts.

Oats

Acreage in oats for the period of record (1886-1956) has consistently been from 25 to 30 percent of the total on Manitoba farms. From 1940 to 1945 barley acreage averaged higher than oats but since then oats has exceeded barley as second only to wheat among the grains. The gross income from oats, while lagging behind barley on the average from 1953 to 1958, was in excess of barley in 1959. Because of wet climatic conditions in recent years barley has declined in some areas. The sustained demand for oats, despite the decline in horses, reflects the degree of mixed farming found in the province. This grain, more than any other, is desired for animal feed, especially for younger stock. The recently developed variety of oats (Rodney) with large, plump kernels accounts for the increased popularity of this grain.

Oats has the most even distribution of the grains, in part a reflection of the widespread occurrence of cattle throughout the province (plate 21), and in part the result of its great adaptability to a variety of environmental conditions. Climatically, oats thrives under a moist, cool summer. It matures earlier than wheat, though not so early as barley. While oats grows best on well drained, medium- to heavy-textured soils, it is tolerant of slightly alkaline, and wet cool soils. It is this high degree of tolerance that explains the importance of oats in areas that are unsuited for wheat and barley. Given adequate moisture, oats is tolerant of sandy soils explaining its occurrences on the upper and lower Assiniboine delta. On plate 20 C, the density to the east of the Red River as well as west of Winnipeg is explained by a concentration of dairy cattle and general farming. In the Arborg district, in the mixed farming district of the lower Assiniboine delta, and in the Dauphin and Swan River districts cattle numbers and oats correlate closely. Distribution is noticeably thin where it competes with barley south of Riding Mountain and with wheat in the southwest; and again in the vicinity of Lake Manitoba where the livestock farm places great dependence on native hay.

Flax

In contrast to oats, flax is highly sensitive to a cash market. Fourth in acreage, its popularity increased after 1940. Its acreage in recent years has ranged from 600,000 to 800,000, and its value from $9 million to $20 million. Flax requires a long growing period, and adapts well to the southwest for, like wheat, it withstands droughty conditions. Moreover, it may be sown after wheat if the latter is damaged by early frost. It prefers medium-textured soils which helps to explain its concentration in the southern Red River valley; and it yields exceptionally well on newly broken land.

Although rye and mixed grains are increasing in importance they provide only a minute percentage of the acreage in grains with 1.3 percent and 2.3 percent each. The former is used largely for distilling, and the latter for fodder. Even with the inclusion of flax these minor grains produced only 6.6 percent of the gross cash income in 1959. Crops which have increased from 1 percent in 1886 to 7.5 percent in recent years are grasses and legumes sown for fodder and seed. Although of importance in soil conservation practices, those crops suffer from overwhelming competition from barley and oats on the one hand, and wild hay on the other, so that in 1959 they provided only 6.8 percent of the gross cash income.

Special Crops and Vegetables

In cultivated area and income received, special and vegetable crops are relatively unimportant. Nevertheless, the rapid growth in popularity, and the local processing plants that have accompanied this growth give them a place of unusual significance. The income from these crops in 1959, although slightly below that of 1958, was $6.4 million, or three percent of the total of all crops. The average gross income from the districts specializing in them, however, is higher than that of any other districts in the province (plate 23 D). In 1959, the area planted to vegetables and special crops was 180,000 acres or 2.4 percent of all crops. While the proportion is small, this is the most intensively used acreage in the province, with the highest return per acre. A distinction is made between *vegetable* and *special* crops. The former include market garden, truck, and canning crops, the principal ones being potatoes, onions, carrots, beets, cabbage, lettuce and celery. The special crops include field peas, buckwheat, sunflower, rape seed, sugar beets, corn for grain, soybeans, field beans, mustard and canary grass seed. Vegetable crops are produced under three kinds of farm organization. (1) Market garden crops are raised within a radius of 25 miles from Winnipeg with the intention of marketing them locally "in season". They are produced mostly on alluvial soils near the Red River, especially to the east of it, and nearly all farms are equipped with sprinkler irrigation drawing water from the river. (2) A second system involves the truck farms located in the southern part of the Red River Valley, about 90 miles from Winnipeg, or in the Souris Valley 200 miles west of Winnipeg. Potatoes and onions principally are raised. Truck farms have storage facilities for marketing the crops "out of season" mostly in the Winnipeg market. (3) Vegetables for canning, localized by the processing plant, are produced near Winkler, Morden and Portage la Prairie. Aside from canning crops, Winnipeg is the principal market for vegetable crops which must be sold fresh as early in the season as possible. Special crops, on the other hand, depend either on local processing plants or distant markets and have very specific requirements of soil and climate.

The Red River plain is best suited to a range of special crops. Climatically, it has an average growing season in excess of 110 days in the south to 100 days north of Winnipeg (plate 8). Measured in growing degree-days, it is the most favoured area in the province (plate 8). Precipitation exceeds 20 inches. In respect to soil, those areas having a medium-textured clay loam to sandy loam are preferred as they drain well, warm quickly in the spring, and are lighter and easier to till. A market is supplied by the local processing plants at Morden, Winkler and Altona in the south, and Portage la Prairie in the Assiniboine Valley.

The distribution of the principal special crops is shown in plates 20 E and F. The most important area of concentration forms a triangle (Pembina Triangle) from Carman to Emerson and west to the escarpment. This is the area of climate and soil optimum for growth (plates 6-8). Together with a second concentration around Steinbach, the Pembina Triangle is settled by Mennonite farmers. A dense population has made for a surplus labour supply and small holdings averaging a quarter-section. Sugar beets are raised within 75 miles of Winnipeg under contract with the Manitoba Sugar Company, whose refinery is in Fort Garry. Medium-textured soils are the principal factor localizing the crops to the areas shown. The industry which initially depended on the abundant labour available from Mennonite farms, is becoming increasingly mechanized. Vegetables, especially peas, beans and sweet corn, for reasons of soil are now grown close to the canneries in Altona and Winkler. High labour costs resulted in a shift in vegetable production from southeast of Winnipeg to the Pembina Triangle. The new canning plant at Portage la Prairie is stimulating growth in this area. Corn for grain in the south does best where temperatures are high. Silage corn follows medium- to coarse-textured soils along the escarpment and in the Steinbach and Winnipeg vicinities where dairying is entrenched (plate 18). Sunflowers were started in 1944-45 in response to a demand by the federal government for vegetable oil. An edible seed variety is also grown. The Altona vegetable oil plant is the first one in Canada and has thereby created the only commercial sunflower market east of Alberta. The long frost-free period with high summer temperatures and ample soil moisture combine to make favourable conditions. Soybeans have their major concentration also in the southern part of the valley. The beans are processed for oil in Altona and the meal is used as livestock feed. Rape seed, also an oil yielding crop, is raised widely throughout the province preferring a cool moist climate. Buckwheat is finding increasing acceptance and grows in areas along the frontier or following a crop which has been killed by early frost. Potatoes traditionally have been produced in market gardens along the Red River north of Winnipeg. Here, the heavy soil is not so favourable as the lighter soils farther south and the production is shifting to the Pembina Triangle.

A

WHEAT

· One dot represents 500 acres

Percent of Land under Crops in Wheat

under 8 | 24 to 32
8 to 16 | 32 to 40
16 to 24 | 40 and over

DBS Census 1956

20 0 20 40 60 Miles

B

BARLEY

· One dot represents 500 acres

Percent of Land under Crops in Barley

under 8 | 24 to 32
8 to 16 | 32 to 40
16 to 24 | 40 and over

DBS Census 1956

20 0 20 40 60 Miles

C

OATS

· One dot represents 500 acres

Percent of Land under Crops in Oats

under 8 | 24 to 32
8 to 16 | 32 to 40
16 to 24 | 40 and over

DBS Census 1956

20 0 20 40 60 Miles

D

FLAX

· One dot represents 500 acres

Percent of Land under Crops in Flax

under 8 | 24 to 32
8 to 16 | 32 to 40
16 to 24 | 40 and over

DBS Census 1956

20 0 20 40 60 Miles

E

SPECIAL CROPS
1956

One dot represents 20 acres

• Vegetables · Sugar beets
• Corn for silage ◆ Vegetable cannery
▲ Sugar beet refinery

DBS Census

10 0 10 20 Miles

Corn for grain — One dot represents 20 acres

F

SPECIAL CROPS
1956

One dot represents 20 acres

• Potatoes · Soybeans
• Sunflowers ▲ Vegetable oil plant

DBS Census

10 0 10 20 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

LIVESTOCK

Although grain crops are traditionally the principal source of agricultural income in Manitoba, livestock production has increased steadily in importance, now accounting for 46 percent of the total gross cash income. In December 1959 the estimated total value of livestock on farms was $80,934,000, and of this, cattle alone were valued at $65,312,000 and hogs at $10,687,000. It is apparent that the most important section of livestock production is that concerned with cattle, although the income derived from hogs and poultry is important (inset, plate 18). In 1959 the value of cattle sold in Manitoba was almost $36.1 million, and an additional $6.7 million in calves. In 1959 cattle sold for beef accounted for 13.3 percent of total gross agricultural income. In June 1959 out of a total of 883,000 cattle, 566,000 were reared for beef purposes, including 224,000 calves and 253,000 cows and heifers.

Cattle are distributed fairly evenly over the agricultural parts of the province, with the exception of the Red River plain, although even here moderate densities occur northwest and southeast of Winnipeg. In these areas dairying, more than beef-raising, is the main occupation of the livestock farmer.

Beef Cattle

High densities of beef cattle occur along the frontier, in the southeast (Franklin 13 and Stuartburn Municipalities) and in the Interlake and Westlake districts. In these, poor drainage and peaty and stony soil restrict the amount of cultivable land and render cropping impracticable. On the other hand an abundance of wild hay and wooded pasture make cattle raising the most profitable type of farming (plate 18). While dairying is important, distance from urban markets results in cream production during the summer months.

In the longer settled southwestern part of the province beef cattle are important in combination with cash grain (mostly wheat) and feed barley and oats (plate 20). A major concentration occurs in the ancient Assiniboine delta from Lake Manitoba to Spruce Woods Forest Reserve. Here the soils are coarse-textured, and even duned in places, finding their best use as pasture land. A notable concentration occurs along the Saskatchewan border from Duck Mountain to the Souris Valley. Much of this land is elevated, or dissected by the Assiniboine and numerous streams flowing into the Souris River from the west. South of the upper Assiniboine on the Reston till plain, large areas are pitted with sloughs or "potholes" and render the land best for cattle. Around Oak Lake, the soils are coarse-textured and in places dunes occur making cropping unprofitable. In the area of the Brandon-Tiger-Pembina hills the terrain is rolling to hilly with numerous sloughs in depressions. Here, the cultivated acreage is restricted mostly to feed grains and the type of agriculture most profitable is mixed farming with emphasis on cattle (plate 18). In the Red River Valley with soil and terrain best adapted to cropping, and with the problem of saline well-water and wet pasture, cattle have never been popular.

The gross returns per acre of farmland obtained from beef cattle is above-average in all the areas mentioned, and is especially high in the area between Lakes Dauphin and Manitoba, in Westlake district, and in the municipalities immediately to the west of the Assiniboine and south along the Saskatchewan border. In these areas the return was over four dollars an acre in 1951.

The great proportion of the beef cattle marketed is shipped to the stockyards at St. Boniface where seven meat packing and processing plants handle much of the trade in meat products along with four other firms located in Winnipeg. In addition, two cattle buying stations are situated at Neepawa and one at Brandon, where there is also a meat processing plant. These packing plants receive livestock from Saskatchewan in addition to Manitoba reared cattle. Two-thirds of the produce is consumed within the province.

Dairy Cattle

Dairying is increasing steadily in importance with the growing urbanization of the province, and in 1959 provided 10.5 percent of the gross cash income of Manitoba farmers. In 1956, over 1,600 farmers shipped fluid milk accounting for over 60 percent of their total farm income. The largest concentrations of dairy cattle occur in several districts in the Red River plain (plate 21), where 135,000 of the 268,000 milk cattle in the province are located. In the southeast (Stuartburn 14 and Franklin) most of the milk produced is made into butter at Vita, Gardenton and Tolstoi, and into powdered milk and cheese at a plant in Grunthal. The most important concentration is centred in Hanover Municipality (17) spreading into neighbouring municipalities east of the Red River (plate 18). This district is one of the principal suppliers of fluid milk to the Winnipeg market, with 500 farms shipping daily. In addition the area supplies the Grunthal plants and a cheese factory at New Bothwell. Northeast of Winnipeg fluid milk is shipped from the Beausejour and Whitemouth River Valley areas, and there is a creamery at Beausejour and a pasteurizing plant at Selkirk. High densities of dairy cattle occur also along the shores of Lakes Winnipeg and Manitoba in the Interlake region, and along the lines of communications leading from these to the Winnipeg area. South of Gimli and Lundar, milk is shipped daily into Winnipeg. To the north, and indeed throughout the Interlake, milk is converted to butter at eleven creameries located in the region. South of Winnipeg the city's milkshed stretches along the Red River and Highway 75 to the United States Boundary, west along the Canadian Pacific Railway line to St. Claude and along the Assiniboine valley as far as Reaburn, west of which milk is shipped into Portage la Prairie. In the Mordon-Winkler district high densities of dairy cattle supply milk to a creamery and ice-cream factory, a pasteurizing plant and a cheese factory.

In all these areas the gross return from dairy cattle alone per acre of farmland is above average. The highest returns are obtained in the dairy belt east of the Red River centred on Hanover Municipality (17). Smaller concentrations of dairy cattle occur around Brandon, west of Portage la Prairie, on the upper slopes of Riding Mountain and in the Roblin, Dauphin and Swan River districts. Portage, Brandon, Dauphin and Swan River each have their small milksheds from which they receive daily consignments of milk. Brandon has the second largest milkshed in the province, stretching along the Trans-Canada Highway in the Assiniboine valley as far as Elkhorn in the west and the Spruce Woods Forest Reserve in the east, and northwards up the slopes of Riding Mountain as far as Erickson and northwest of Glenella. In Brandon, Portage, Dauphin, Swan River, Shoal Lake, Minnedosa and Souris are located pasteurizing plants. In general, dairy cattle are few in the southwest, producing only cream during the summer. There the emphasis is on beef cattle.

The distribution of dairy cattle reflects a combination of the demands for fluid milk made by the large and increasing urban markets, especially Greater Winnipeg, together with an abundance of hayland and pasture on the eastern and northern fringes of agricultural settlement. A third factor of considerable importance has been the activities of the Mennonite section of Manitoba's population, who have combined dairy farming with other types of livestock farming, and with cereal production and the growing of special crops in an intensive, mixed type of farming. This accounts for the unusual number of plants processing dairy products located in areas settled by Mennonite people.

Despite the large demand for liquid milk in the towns and cities, nearly 60 percent is made into butter, which for many years has enjoyed a high domestic reputation in Canada. It is exported to Ontario. Canadian cheddar cheese is another important dairy product. In general it is the producers of milk for liquid consumption in the cities or for conversion into cheese who may be termed dairy farmers, and who rely upon dairy produce for the larger proportion of their income. Those who produce milk for butter are mostly engaged in mixed farming. The distribution of creameries as compared to pasteurizing plants reveals the diversity which exists in the dairying industry of the province.

Poultry

Third, as a source of cash income to the farmer is poultry products, accounting for 8.7 percent of the total in 1959. Although poultry are kept on many farms throughout the province for domestic use or for purely local markets, poultry raising becomes a specialty in the Red River valley. Here, in June 1958, 4.5 million out of a provincial total of 8 million birds were accounted for. Densities are very high in Cartier (51) and Charleswood Municipalities south of the Assiniboine, in the Altona-Winkler-Morris area, and in the Municipalities east of the Red River from Hanover (17) to Winnipeg, with an exceptionally high concentration in the former. In these areas gross returns per acre of farmland are well above average. Broiler chickens and eggs produced in these districts are shipped to Winnipeg. Proximity to this market of 450,000 people together with the enterprise of the Mennonite farmer account for the high concentrations in the localities noted.

Poultry processing plants (killing and eviscerating) are located at Headingley, Winnipeg, Morden, Winkler, Blumenort, Carman and Niverville within the Red River area. In the remainder of the province there are plants at Portage, Carberry, Brandon, Gladstone, Neepawa, Boissevain, Lac du Bonnet and Dauphin. These serve large areas of small individual output in contrast to the restricted areas and intensive production of the Red River valley. Areas of moderate density and returns per acre occur in the Dauphin and Gilbert Plains district.

In 1959 the numbers of poultry in the province were approximately 7,000,000 hens and chickens and 1,250,000 turkeys which had increased rapidly from total of 370,000 in 1950, due to the interest of Mennonite and Hutterite farmers in this type of poultry. Geese and ducks are unimportant, totalling only 42 and 36 thousand respectively in 1959.

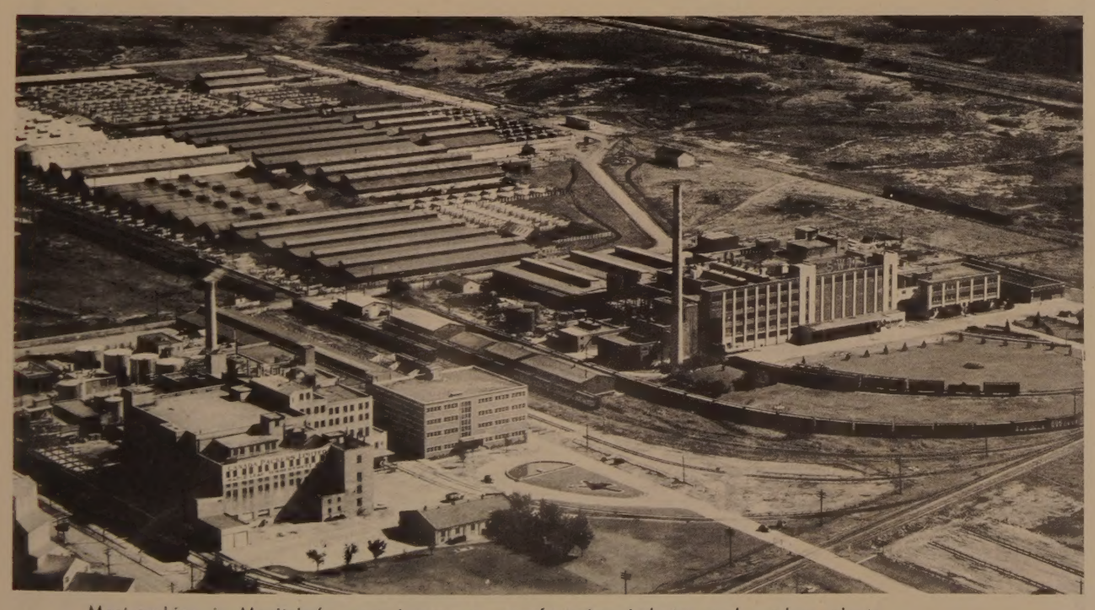
Hogs

Not far below poultry in the total agricultural output of the province is hog production. Densities in the east follow a pattern similar to that of poultry, with the highest numbers in the Cartier, Charleswood and Hanover municipalities. The reasons for this distribution are again proximity to the market of Greater Winnipeg and the existence of intensive farming and more developed commercial organization in the Mennonite areas. Hogs reach high densities in the Swan River and Dauphin areas where a surplus of barley is used for feed. Around Virden and Brandon, and from Killarney eastwards through the south central part of the province high densities continue into the Morden and Winkler district. In these areas hog rearing is connected with grain farming particularly barley production, and with corn production in the latter area. In June 1959 the numbers of hogs in the province totalled 505,000.

Sheep are the least important livestock, and in 1959 they numbered only 78,000 valued at $507,300. They provide only a small proportion of the gross income from agriculture. Numerically they have decreased from almost 300,000 in 1942. They are distributed throughout the agricultural area showing some preference for the margins where they form a useful part of total farm income, but where they are subject to attack by wolves and coyotes.

Horses, too, have declined in recent years from 300,000 in 1942 to 60,000 in 1959. This is almost entirely the result of increased mechanization. Horses remain important only on the northern and eastern fringes of the agricultural area where cultivated land occurs in small parcels with conditions difficult for mechanically drawn implements, and where semi-subsistence farmers neither require nor can afford machinery.

With the exception of horses and sheep, livestock numbers have been steadily increasing. This is, in part, in response to a growing urban market in Greater Winnipeg as well as a lively demand outside the province.



Meat-packing is Manitoba's most important manufacturing industry and modern plants in Manitoba process livestock from all parts of western Canada.

Farms in Manitoba are becoming increasingly diversified and are adopting the most modern agricultural practices.

A — BEEF CATTLE

· One dot represents 50 animals

Gross returns per Acre of Farm Land in dollars

- under 1
- 1 to 2
- 2 to 3
- 3 to 4
- 4 to 5
- 5 and over

DBS Census 1956

20 0 20 40 60 Miles

B — DAIRY CATTLE

(Milking cows and heifers one year and over)

· One dot represents 50 animals

Gross Returns per Acre of Farm Land in dollars

- under 1
- 1 to 2
- 2 to 3
- 3 to 4
- 4 to 5
- 5 and over

DBS Census 1956

20 0 20 40 60 Miles

C — LIVESTOCK Processing Facilities

Figures within symbols indicate more than one plant.

▲ Poultry plants ■ Meat packing plants ● Cattle buying stations

Gross returns per Acre of Farm Land in dollars

- under 3
- 3 to 4
- 4 to 5
- 5 to 6
- 6 to 8
- 8 and over

DBS Census 1956

20 0 20 40 60 Miles

D — MILK PROCESSING PLANTS

Figures within symbols indicate more than one plant.

- Creamery
- Pasteurizing plant
- Creamery and Pasteurizing plant
- Ice cream
- Milk powdering plant
- Cheese factory
- Daily Milk shed area

20 0 20 40 60 Miles

E — POULTRY

· One dot represents 2000 birds

Gross returns per Acre of Farm Land in dollars

- under .50
- .50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- 3.00 and over

DBS Census 1956

20 0 20 40 60 Miles

F — HOGS

• One dot represents 50 animals

Gross returns per Acre of Farm Land in dollars

- under .25
- .25 to .50
- .50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 and over

DBS Census 1956

20 0 20 40 60 Miles

PROVINCE OF MANITOBA DEPT OF INDUSTRY AND COMMERCE

FARM ECONOMIC DATA (I)

The maps on plates 22 and 23 set forth farm values under which is included value of (1) land and buildings, (2) implements and machinery and (3) livestock. These data are expressed in terms of the average *per farm* and *per acre*. In the former case it is possible to compare values in terms of an economic unit; in the latter, one may compare values by areal units. The former reflects strongly a type of organization, the latter, productivity per unit area.

AVERAGE FARM VALUES, 1901-1951

	1901	1911	1921	1931	1941	1951
Land and Buildings						
per farm	3,512	8,539	9,273	5,326	3,955	10,096
per acre	13	31	34	19	14	30
Implements and Machinery						
per farm	377	641	1,274	1,012	1,015	4,425
per acre	1	2	5	4	3	13
Livestock						
per farm	803	1,437	1,422	823	875	2,980
per acre	3	5	5	3	3	9
TOTAL						
per farm	4,692	10,617	11,969	7,161	5,845	17,501
per acre	17	38	44	26	20	52

Source: Census of Canada 1951, Agriculture, vol. 6, Part 2.

In the decade 1941 to 1951 average farm values increased by 200 percent (see graph). The most notable increase was in the value of machinery which more than trebled both per farm and per acre. This strong trend towards mechanization is a factor underlying a decrease in farm population and labour requirements (plate 23F). Next in rate of increase was livestock which doubled in value on the average farm. The increase in value of land and buildings exceeded 150 percent. This somewhat lower rate reflects in part the lag in replacement of farm buildings.

AVERAGE VALUE OF FARMS (22A)

The average value of farms for the latest census year (1951) in Manitoba was $17,500 which was higher than that of Ontario and nearly as high as that of Saskatchewan. Of this amount land and buildings comprise 57 percent, implements and machinery 25 percent and livestock 18 percent. This reflects the emphasis on crop land and grain production, rather than on livestock as the principal source of income. This is indicated in the Types of Farming map (plate 18) in which those farms obtaining more than 70 percent of their income from grain are also the farms having the highest unit value. Those farms on which grain and livestock share about equal emphasis are intermediate in the scale of value, while farms devoted mainly to cattle raising have the lowest value.

The distribution of farm units by value indicates not only type of farming but also the quality of soil for crops, the suitability of the land for the use of farm machinery, the amount of land under cultivation and the size of the farm unit.

From plate 22A it is apparent that the farms of greatest value ($20,000 to over $32,000 in 1951) are found in the Red River plain mostly west of the river and also in the west and central part of the province from Brandon south to the border. These are the areas of the large grain (especially wheat) farms (plate 18). Capital investment in land and machinery is high because soils are productive and topography favourable for mechanization. The intermediate value areas show a higher percentage of unimproved land and less capital invested in machinery. Farms of low value occupy the margin of settlement where poor soil, shorter growing season, drainage problems, part-time and subsistence farming combine. The effect of Winnipeg on land values is apparent west of the city. Large cattle farms around the lakes have a high incidence of unimproved land and require little machinery, factors which decrease the total value of their holdings.

VALUE OF FARMS PER ACRE (22B)

Unlike the previous map showing value of farm units, map 22B indicates the value per acre. It reveals areas of intensive use where larger amounts of capital have been invested per unit area. Thus where land values appear low on both maps 22A and 22B physical conditions of the land are poor for farming. Where values are high in 22A and not in 22B farming on an extensive scale is carried on. Where values are high in 22B and not in 22A small, intensively cultivated units are indicated.

By these criteria the Red River valley stands out as an area of high value both per farm and per acre, denoting an area of prosperous, progressive farms. In 22B are shown the intensively used lands of smaller holdings east of the Red River where sugar beets, vegetables and poultry are raised. The area of special crops such as sunflowers, sugar beets and potatoes in the southern part of the valley from Carman to Morden and Altona are emphasized as having among the highest per acre values in the province. Also in this category are the market gardens and nurseries in the vicinity of Winnipeg. To some degree the urban influence on land values is reflected in this area and to a lesser extent around Portage la Prairie and Brandon. The municipalities of MacDonald (40) and Portage la Prairie (53) have highly productive soils and a high percentage of improved land. The former is a specialized wheat producing area while the latter is experiencing a trend to intensification as special crops become more important.

VALUE OF LIVESTOCK PER FARM (22C)

The maps showing value of livestock (22C and D) should be compared with plates 21 and 18. In map 22C three areas of high value stand out: the vicinity of Lake Manitoba, the Spruce Woods Forest Reserve and the municipalities of Archie (60), Ellice (90) and Sifton (30) along the western boundary. Average farm size in these areas is great, ranging from 400 to 1,000 acres (19A). The physical quality of the land is low for crop raising (19F) so the emphasis has been placed on beef cattle. Sandy soils around Oak Lake and the Spruce Woods, rough land and the high incidence of sloughs on the Saskatchewan boundary and the flooding of lands near Lake Manitoba discourage cropping. Intermediate are areas of mixed farming (plate 18) while the grain specialty areas have a low value of livestock per farm.

Farming in Manitoba is highly mechanized.

VALUE OF LIVESTOCK PER ACRE (22D)

In many respects this map corresponds to 22C except that the significance of smaller farms becomes evident. To the east of the Red River in a band extending northward into the Interlake district we find a high per acre value where emphasis is placed on dairying and poultry production (21A and C). Farms average about 320 acres. The incidence of dairying in Hanover (17), a high concentration of poultry farms and the emphasis on dairy and beef cattle in the Interlake district account in large part for the relatively high per acre values. In general, the mixed farms occupy the intermediate range in the value scale, while grain specialty areas are clearly indicated as having a low value of livestock per acre.

VALUE OF LAND AND BUILDINGS PER FARM (22E)

The most important component of a Manitoba farm is the value of the land and buildings, particularly the land. This fact is reflected in the close correspondence between maps 22E and 22A.

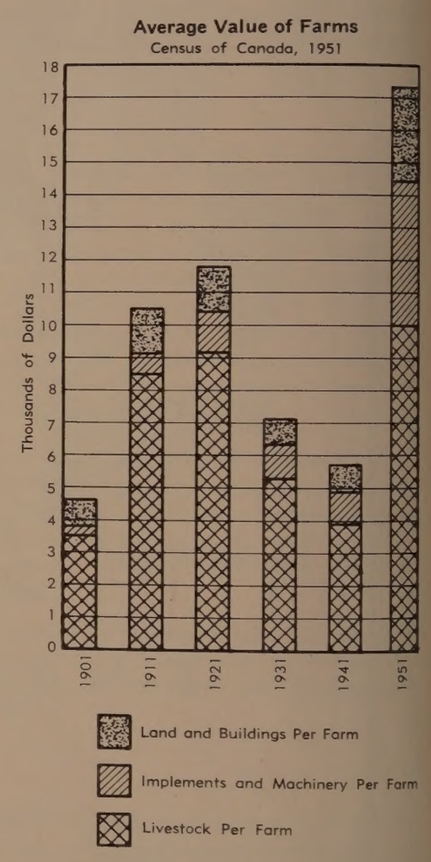
The value of land is in part occasioned by its physical properties: productivity of the soil, topography, drainage and climate, although proximity to urban amenities and markets and the adequacy of roads may be highy important in some cases. Cash grain is still predominant in Manitoba and wherever the factors of production are favourable to grain farming, land values are high. Where local market conditions are more favourable, the emphasis has shifted to the raising of special crops subject, of course, to the physical characteristics of the land.

In general the factors favouring cash grain crops are found in combination in two major areas: the Red River plain, especially west of the river, and the belt of land south of Riding Mountain to the International Boundary. In the Red River valley fine and medium-textured Black soils, flat terrain and favourable climate combine. West of Winnipeg, high values are associated with high productivity of the farms together with advantages of proximity to the city. Since the war market conditions have encouraged the trend to special crops where medium-textured soils and a long growing season provide ideal conditions for producing row crops. The major belt to the west affords favourable soil and topography with climatic conditions optimum for wheat and mixed grains.

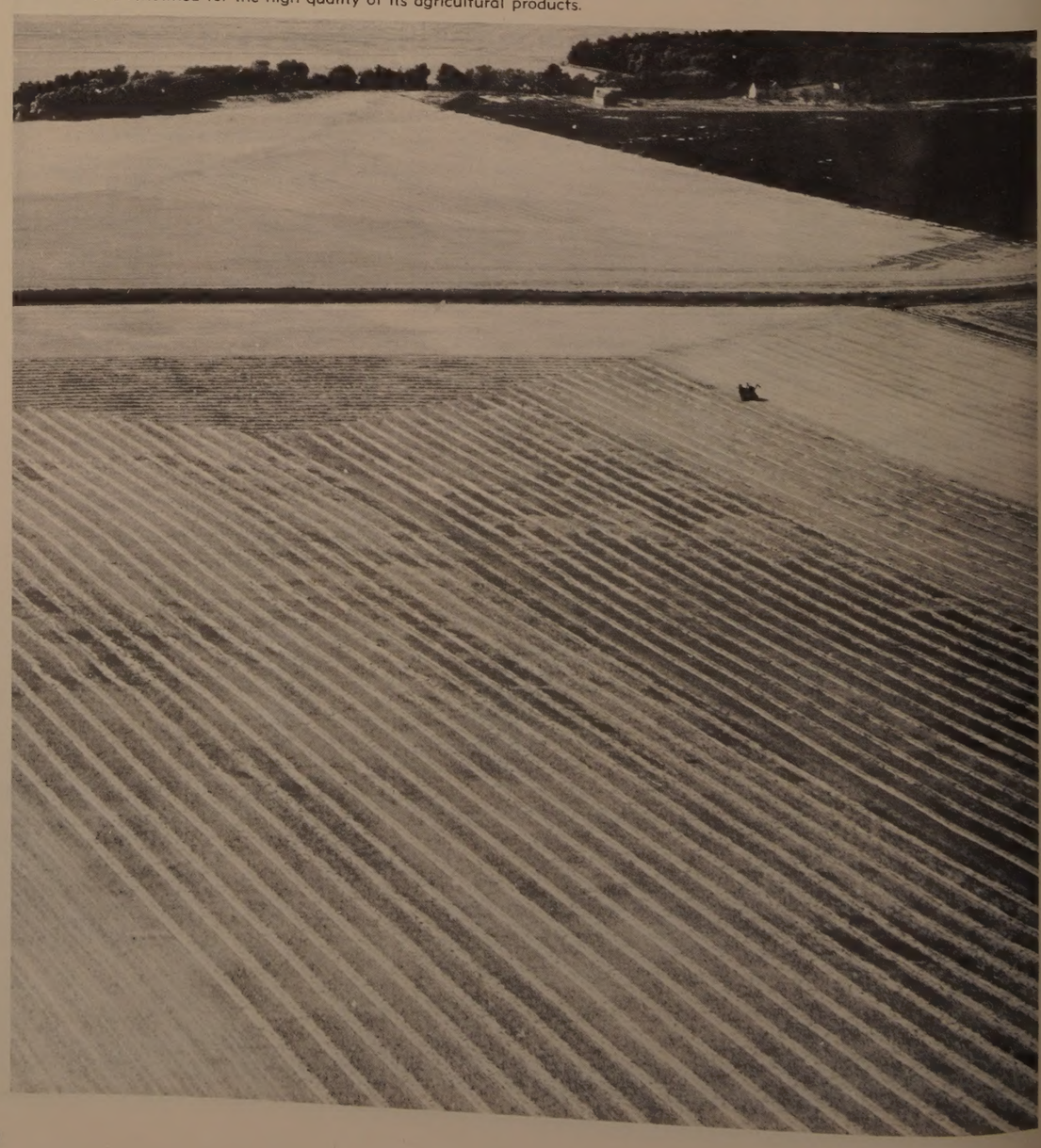
Soil is particularly significant in the pattern of high land values (plate 6). A wet spring followed by a warm dry summer are ideal for high protein wheat, as indicated by the wheat specialty area to the west (plate 18). On the other hand, areas of sandy soil and terrain broken by sloughs or rough topography correspond with farms of medium value (map 22E). On the margins of settlement where a large part of the area is unimproved land, farm values are low.

VALUE OF LAND AND BUILDINGS PER ACRE (22F)

A comparison of this map with the former (22E) indicates a lessening of values in the extensive grain growing areas to the west. This may be explained by the size of farms and extensive practices used, together with lower productivity per unit area. The larger percentage of the land in fallow as we go westward is also important in the per acre decrease in land value. The Red River plain continues to stand out as the area of maximum land values both per acre and per farm. Intensity of use associated with smaller, highly productive holdings, the thrifty practices of the Hutterite and Mennonite farmer, the market gardens around Winnipeg and special crop areas of Stanley (10), Rhineland (11) and Portage la Prairie (53) municipalities all contribute to an understanding of value concentration in these areas. Much land is left in fallow and a high proportion is improved (20F). Competition for productive land near the Winnipeg vegetable and poultry products market is reflected in the high values of the tributary region.



Crop farming is dominant in Manitoba and the province is world-renowned for the high quality of its agricultural products.



A

AVERAGE VALUE of FARMS

Based on total of land, buildings, machinery and livestock

(in 1000's of dollars)

- under 8
- 8 to 12
- 12 to 16
- 16 to 20
- 20 to 24
- 24 to 28
- 28 to 32

DBS Census 1951

20 0 20 40 60 Miles

B

AVERAGE VALUE of FARMS per ACRE

Based on total of land, buildings, machinery and livestock

(in dollars)

- under 36
- 36 to 45
- 45 to 54
- 54 to 63
- 63 to 72
- 72 to 81
- 81 and over

DBS Census 1951

20 0 20 40 60 Miles

C

VALUE of LIVESTOCK per FARM

(in 1000's of dollars)

- under 2
- 2 to 3
- 3 to 4
- 4 to 5
- 5 to 6
- 6 to 7

DBS Census 1951

20 0 20 40 60 Miles

D

VALUE of LIVESTOCK per ACRE of LAND in FARMS

(in dollars)

- under 6
- 6 to 7.5
- 7.5 to 9
- 9 to 10.5
- 10.5 to 12
- 12 and over

DBS Census 1951

20 0 20 40 60 Miles

E

VALUE of LAND and BUILDINGS per FARM

(in 1000's of dollars)

- under 3
- 3 to 6
- 6 to 9
- 9 to 12
- 12 to 15
- 15 and over

DBS Census 1951

20 0 20 40 60 Miles

F

VALUE of LAND and BUILDINGS per ACRE of LAND in FARMS

(in dollars)

- under 15
- 15 to 25
- 25 to 35
- 35 to 45
- 45 to 55
- 55 and over

DBS Census 1951

20 0 20 40 60 Miles

PROVINCE OF MANITOBA, DEPT OF INDUSTRY AND COMMERCE

FARM ECONOMIC DATA (II)

Since the close of the second world war Manitoba farms have been undergoing a revolution in respect to quantity and kinds of machinery used in farm work. In 1941 machinery comprised 17 percent of the value of the farm. In 1951 the figure had risen to 25 percent with every indication of a continuing upward trend. In 1941 the average value of machinery per farm was $1,015, whereas a decade later it was $4,425. On an acreage basis, the increase has been even greater, from a value of $3 in 1941 to $13 in 1951 (see table page 48). In the same period the number of farms with tractors doubled, and by 1956 reached 42,236 or 85 percent of all farms in the province. In the same interval the number of combines increased from 1,714 to 21,425 or one for every 202 farms in the province. Eighty-five percent of all farms (42,093) are supplied with electric power at rates among the lowest on the continent. The mechanization of farm work has been accompanied by the virtual elimination of work animals except on marginal farms. From over 300,000 horses in 1941 the number diminished to 65,000 in 1958.

This mechanization of farm practices has touched off a chain reaction which has penetrated every aspect of rural life. Total production has steadily increased, especially field crops, creating problems of over-production and price stability. It has served to offset low yields per acre by decreasing unit costs. It has promoted better tillage practices as, for example, subsurface plowing. More efficient use of insecticides and herbicides has effected pest and weed control. In general the standard of living and working conditions has risen substantially in many rural areas.

Mechanization has had far-reaching effects on land tenure and size of farms. No longer is an economic unit for small grain farming a half-section or even three-quarter section. In consequence grain farms, especially wheat farms, have been obliged to expand their holdings to insure more efficient use of fixed capital. The marginal operator has found it to his advantage to sell, and farm consolidation has absorbed many uneconomic units. In order to avoid the necessity of securing or tying up capital, many farm holdings have increased in size through renting. This is most evident in the grain farming areas (24C and 24D). The need for expanded credit facilities has likewise accompanied mechanization.

Indirectly, mechanization has brought about many social changes in the rural community. The farm unit has become more specialized, less self-sufficient and more dependent on towns for services. The highly specialized grain farm no longer requires the family to remain the year round on the farmstead and in some areas many have taken up residence in neighboring towns. This has added to the amenities of rural living but has resulted in the disintegration of the small community whose social life was built around the one-room school. The decreasing number of farms has made it more costly to supply services, especially adequate school facilities and to maintain roads, although the latter have become increasingly important.

Finally, mechanization has speeded the depopulation of rural areas by eliminating the need for additional labor, and to some extent reducing the value of large families. In common with the whole prairie region, almost every rural township in the province has lost population since 1941 (page 30). This is further emphasized by a decline in farm population for the period 1941-56 of 17 percent. Only 29 percent of the farms reporting used hired labor in 1956. Not all parts of the agricultural region are mechanized to the same extent. The degree to which machinery is used is very closely related to the type of farm (plate 18). As might be expected, mixed farms, dairy and beef producing farms are less highly mechanized.

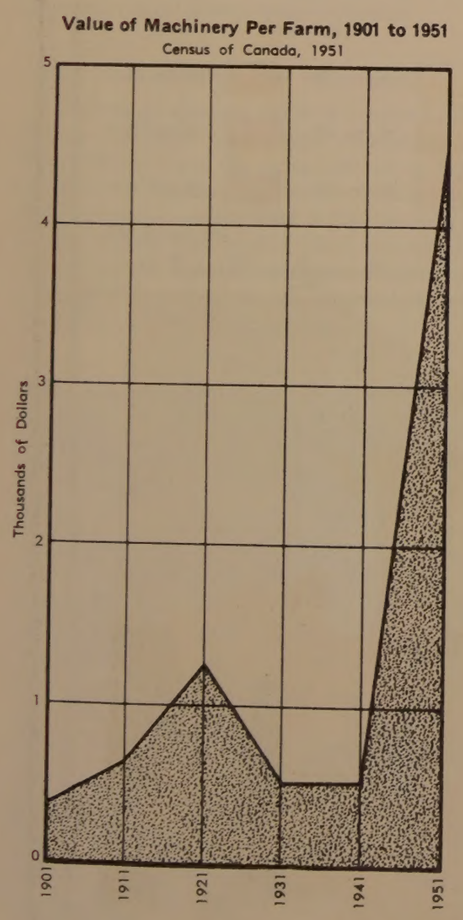
Value of Machinery Per Farm (23A)

The degree of mechanization in various parts of Manitoba is shown on Map 23A in terms of the capital invested in machinery per farm. Two areas of high concentration stand out: the Red River plain west of Winnipeg and a belt running south of Minnedosa to the U.S. boundary. This in turn correlates with the type of farming and size of farms in these areas. Both are grain specialty areas (plate 18) and both have a high percentage of the crop in wheat. Livestock is secondary or even absent on many of these farms. At the same time, these areas of high value correspond to the areas of large farms (400 to 500 acres), although not always to the largest. The latter are to some extent in areas of extensive cattle raising (19A). Areas of high-value concentration are also areas of topography and soil favourable to the use of farm machinery on a large scale. Lands that are interrupted by sloughs or apt to be stony or have sandy, less productive soil do not yield a sufficient return per acre to justify the high capital investment involved in complete mechanization.

Intermediate values per farm ($4,000 to $5,000) are typical of the mixed farms and of farms in the 320- to 400-acre category. Farms with low capital investment in machinery are (1) smaller in size (160 to 240 acres), (2) on the fringe of settlement where, in many cases, production is low and soils stony and (3) in areas of dairying, poultry and vegetable farming. Large cattle farms on the frontier, despite their size, do not require the same degree of mechanization as grain farms.

Value of Machinery Per Acre (23B)

A shifting emphasis from the west to the east has occurred in the per acre distribution of machinery values. This is due to the change in unit from the farm to the acre. In the former map (23A), the large farm was emphasized; in this map, the small holding is indicated in which intensive crop production is an important aspect of farm economy. Thus the quarter-section holdings east of the Red River where feed grains, vegetables, sugar beets and other row crops are produced on a more intensive basis and where each operator of a small holding owns at least a tractor and various types of specialized equipment, the value per acre is strikingly high.



The rapid rise of machinery after 1941 is indicative of the high degree of mechanization on Manitoba farms.

Immediately west of the Red River the value of machinery is high per farm as well as per acre. Reasons vary between the north and the south. East of Winnipeg, while farms are large (320 to 500 acres), the capital invested in machinery is proportionately large. To some extent this may represent over-capitalization, but it must be borne in mind that the heavy clay soils, while highly productive, require heavier machinery to till the land, including caterpillar tractors. Income per acre (23D) bears out the practicability of these methods. In Cartier municipality (51) and to a lesser extent in Portage la Prairie municipality (53) the land is intensively farmed in large blocks by Hutterite settlers whose thrifty methods and advanced practices are well known.

In the southern part of the valley, while machinery per farm is median in the scale, value per acre is high. The lower value per farm may be expected since farm sizes are moderate (240 to 320 acres average). But the high value per acre is the direct result of more intensive practices related to the raising of special crops.

Sugar beets, sunflowers, canning vegetables and potatoes have made necessary planters, thinning machines, rotary hoes, row crop cultivators and tractors, corn pickers and shellers and bean pullers to mention a few. To a lesser degree the introduction of special crops tributary to Portage la Prairie is transforming the farm type in that district.

On the uplands to the west where extensive methods of grain farming are employed value per acre of machinery is less relative to the Red River plain. Two areas stand out to the north: the Dauphin-Gilbert Plains district and the Swan River Valley. Farm units are smaller and individual ownership of machinery is high, made possible by a high productivity per acre (23D). Here also the emphasis is on grain farming.

As livestock assumes a more prominent place on the farm, capital investment in machinery is relatively less. As a result the mixed farming and large cattle raising sections stand out as low.

Average Gross Income (23C-D)

The average annual gross income from the farms of Manitoba for the period 1950 to 1957 was $301,396,000.[1] The income for individual years fluctuates appreciably depending mainly on the condition of the weather and the market. In 1958 the estimated gross income was $320,000,000 divided between the various sources of production according to the graph on plate 18. Using the 1956 Census farm-area data the average annual income per farm for the period was $6,125, while the average per acre was $17.

The data presented in map form (23C and D) indicates the average income by municipality in 1951, the latest farm year for income statistics on a municipal base. While income per farm has increased since that year, the relationship between municipalities has not changed appreciably. The maps serve to indicate areas of high, medium and low income per farm and per acre.

The map of average gross income *per farm* is a direct measure of all the factors of agricultural production assuming that the existing farm sizes are optimum and that the type of agriculture is the best for the area. It has the limitations, however, of representing conditions for only one year (1951). It correlates closely with the average value of farms (22A) as might be expected, since value ought to be reflected in income. It also correlates closely with the grain specialty farms (plate 18) and with the value of machinery (23A). It would strongly suggest, for the year under consideration, that the most economic unit was the large, mechanized grain farm, with a high investment in machinery and land.

This map does not, however, reveal net incomes which might vary somewhat in detail since some farms may be over-capitalized. It may be said to represent the areas of highly productive soil, topography favorable to extensive cultivation, and climate suited to grain crops.

Areas of intermediate gross income with the exception of parts of the Red River plain are less specialized in grain production, and include land poorer for extensive tillage and sandy, less productive soil. In some cases, sizes of farm or type of farming is not optimum. This map indicates very directly areas of subsistence agriculture indicated along the fringe of settlement.

Map 23D showing gross income *per acre* varies in a number of municipalities from income per farm. This is to be expected in areas of intensive use where farms are usually smaller than optimum. Two areas fall into this category: the special crops area in the southern Red River Valley and the mixed farms around Steinbach. The cash grain farms in the Dauphin plain and Swan River district have a moderately high income per acre. In these districts farm sizes vary from a quarter to three-quarter section units, somewhat smaller than optimum for the most efficient use of modern farm machinery. Subsistence farms are indicated in areas of low income per acre and per farm. These point up the agriculturally marginal areas of the province where growing season is short, soils inferior for grain crops, drainage frequently imperfect and the size of unit unsuited to the type of farming. Indeed, in many of these areas of low farming income the people are engaged in other activities on a part-time basis (23F).

Commercial Farms (23E)

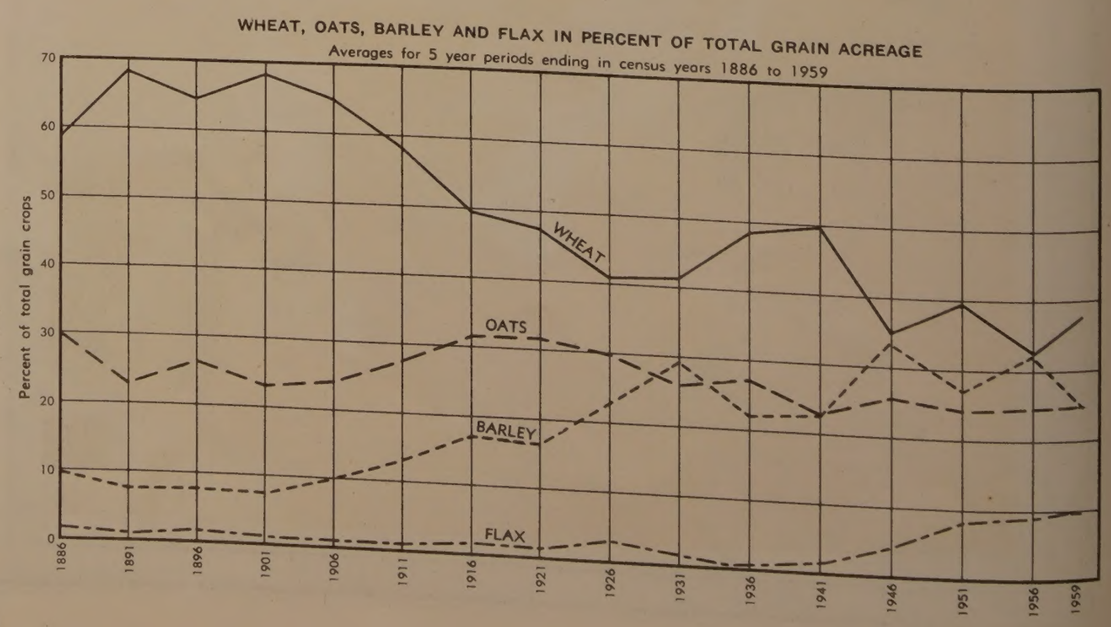
All farms with a total of $1,200 income or more (1951) were classified as "commercial". Nearly all municipalities lying to the west of a line from the Dauphin plain to the southeast corner of the Red River plain have a high percentage of commercial farms. East of this line the percentage of non-commercial farms increases toward the non-agriculture fringe. There are two basic reasons for the marginal location of the non-commercial farms. In the first place, physical conditions of soil, drainage, and growing season combine to make these lands unattractive for cropping. In the second place, opportunity for part-time employment in fishing, wood-cutting or in nearby urban centres, especially Winnipeg, enable the part-time farmer to supplement his income. Two exceptions in the large triangle of commercial farms is apparent: Cornwallis municipality (33) in which Brandon is situated and the municipalities of Rhineland (11) and Stanley (10). In the former case, part-time employment is available in nearby Brandon; in the latter, many holdings are so small as to be uneconomic and employment is found in towns or on neighboring farms.

Non-Farm Work (23F)

This map shows the distribution of the average number of days per year when farmers engage in employment off their farms. Except in detail it is complementary to the distribution of commercial farms (23E). From a very low incidence of non-farm work in the southwestern triangle, the length of employment in non-farm work increases to the periphery of agriculture. Reasons for this increase lie in part with the physical capabilities of the land to produce crops. However, to the Icelandic settlers in the vicinity of Lake Winnipeg, a combination of farming and fishing is a cultural heritage. To those engaged in the fisheries of Lake Manitoba, the same pattern of employment is followed. On the other hand, the subsistence farmer on marginal land on the eastern fringes of the Red River Plain has little choice. In the vicinity of the Sandilands and north to the Interlake and Westlake districts where farms are small and conditions of soil and drainage poor the farmer is obliged to supplement his meagre returns from agriculture with employment elsewhere. Many find work cutting pulp-wood during the winter months.

The strong attraction of Winnipeg and to a lesser extent towns such as Portage la Prairie, Brandon and Morden cause some farmers to leave their farms and take up winter residence in the city. Those within commuting distance of Winnipeg frequently work in the city part of the year or even part of each day, tending a few acres in the summer or during "off-hours". Some employ the family in farm work.

[1]Estimate, Manitoba Department of Agriculture, Statistics Branch, 1959.



A

VALUE of MACHINERY per FARM
(in 1000's of dollars)

1 to 2
2 to 3
3 to 4
4 to 5
5 to 6
6 to 7
7 and over

DBS Census 1951

20 0 20 40 60 Miles

B

VALUE of MACHINERY per ACRE of LAND in FARMS
(in dollars)

under 6
6 to 9
9 to 12
12 to 15
15 to 18
18 and over

DBS Census 1951

20 0 20 40 60 Miles

C

AVERAGE GROSS INCOME per FARM
(in 1000's of dollars)

under 1
1 to 2
2 to 3
3 to 4
4 to 5
5 and over

DBS Census 1951

20 0 20 40 60 Miles

D

AVERAGE GROSS INCOME per ACRE of LAND in FARMS
(in dollars)

under 4
4 to 6
6 to 8
8 to 10
10 to 12
12 to 14
14 and over

DBS Census 1951

20 0 20 40 60 Miles

E

COMMERCIAL FARMS* as PERCENT of ALL FARMS

under 80
80 to 84
84 to 88
88 to 92
92 to 96
96 to 100

*Gross income of 1200 dollars and over 1956

20 0 20 40 60 Miles

F

NON-FARM WORK*

under 5
5 to 10
10 to 20
20 to 40
40 to 80
80 and over

*Average number of days farm operators engaged in non-farm work

DBS Census 1956

20 0 20 40 60 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

FARM TENURE

This group of maps is concerned with farm population and the principal ways in which farm property is held. Frequent reference is made to rural population and population change on pages 24 and 30. However, maps 24A and 24B are concerned with distribution of people per farm and with the rate of change in farm population. These maps should be compared with plates 31 and 33.

In the 15-year interval from the early war years to 1956 Manitoba's population increased by 16 percent. During the same period the farm population decreased by 42,870 or 17 percent. During this period there was also a decline in the number of farm families from 58,024 to 49,201, a rate of 15 percent. The average size of the family including hired help also declined slightly in this period from 4.3 to 4.2. This exodus from farm to town was accompanied by farm consolidation and abandonment. General technological advances in farming including increased use of machinery, greater economic prospects in urban employment and the preference for the amenities of city life are the basic reasons for farm depopulation. Whereas losses of population on the farms may be regarded by some as undesirable, changing techniques in agriculture will inevitably result in social changes. And if the farm as an economic unit is to remain on a sound competitive basis, these changes are actually desirable, although the social life of the community may suffer initially during the period of readjustment.

Average Number of Persons per Farm (24A)

The average number of persons per farm, includes not only the family but also hired labour. For much of southwest Manitoba the number varies from 3 to 6. The majority of municipalities fall between 3.6 and 4 per farm.

The low numbers per farm may be attributed to the widespread use of machinery and other labour-saving devices which have to a great extent eliminated permanent hired help. Then, too, the farm as a way of life has lost much of its attractiveness to young people who are drawn to urban employment early in life. To some extent variations in the pattern correlate with certain ethnic groups. The southwest was settled largely by people of British origin and this group with a tendency to small families is dominant there today (plate 17).

One factor which must be taken into account in assessing reasons for low averages per farm is the considerable number of farms with non-resident operators, i.e. owners who maintain a home in the town or city but have no one residing on the farm (24B). Three examples of this stand out in 24A: municipalities such as Edward (1) in the southwest; Minitonas (114), in the Swan River Plain; and the upper Interlake municipalities of Bifrost (97) and Fisher (98.1). In every case, the explanation lies in the large percentage of absentee or non-resident farmers as shown in 25B. This tendency, well marked in the examples given, is strongly repeated in MacDonald (40) and other municipalities adjacent to Winnipeg.

Of unusual interest, however, are certain districts with a much higher than average number per farm. These correlate unmistakably with certain ethnic groups where families are large, or where an effort is made to keep the family on the farm. This is true of the Hutterites, Mennonites and peoples of French language. Cartier (51) has no less than nine colonies of Hutterites while Portage la Prairie (53) has four, with families frequently running as high as ten persons. In addition there is a substantial Mennonite and French population in this area. Other municipalities with large French speaking populations are Montcalm (12), DeSalaberry (18), Ste. Anne (43), Park (94.2), Ellice (90), St. Laurent (70), and Alonsa (81.2). Mennonite municipalities of Stanley (10), Rhineland (11) and Hanover (17) are added examples. (Figures in brackets refer to map.)

Percentage Change in Farm Population (24B)

This map correlates closely with plate 14 (population trends), except that the latter includes hamlets of under 50 people. As noted above, the farm population of the province has decreased 17 percent between the years 1941-1956. Since this does not represent a net loss to the province, it means a transfer to cities and towns. The aftermath of this movement has brought about farm abandonment in areas physically unsuited for agriculture (19C) and farm consolidation (19B) where larger holdings proved more economic. In addition, many farm families have moved into nearby towns, especially in the extensive grain farming districts (24C). The municipalities that have suffered most are along the fringe of settlement beginning in the southeast and extending to the Interlake. The same is true of those located south of Riding Mountain. In the southeast, the exodus has resulted mainly in farm abandonment, although in the other fringe areas consolidation as well as abandonment has also gone on (19B). The rate of abandonment has been high south and east of Duck Mountain where flooding of land along the Escarpment is a problem. In the Swan River district many farmers have taken up residence in the town, which has grown rapidly in recent years (plate 14).

The somewhat higher rate of loss in the southwest part of the province may also be related to "suitcase farming". As the Saskatchewan Royal Commission found, areas of specialized grain farming have a higher incidence of farmers taking up residence in towns than is the case in the "park-belt" where mixed farming is the rule.

Very few municipalities showed a gain in farm population and in these cases an ethnic factor usually underlies the increase. The municipalities of St. Laurent, Ellice and St. Francois Xavier are predominantly French, while Cartier has a concentration of Hutterite Colonies besides a Mennonite-French population. In the vicinity of Winnipeg, the inclination to divide small holdings has tended to increase the farm population, many of whom commute to Winnipeg and use the farm largely for residence purposes.

Chief amongst Manitoba resources are large amounts of excellent land suitable for agriculture.

Percent of Farms With Non-Resident Operators (24C)

This map shows by municipalities the percentage of farms operated by owners who do not reside on the farm. In general from 4 to 12 percent of the farms in most municipalities are operated by non-residents. These consist of (1) owners living in nearby towns ("suitcase farmers") who commute daily to the farms, (2) owners living in towns and cities who depend upon seasonal employment to supplement income from the farms, and (3) owners who operate more than the one farm on which they reside.

The percentage distribution of non-resident operators to an extent conforms to the type of farming. Areas in which dairying, poultry raising and mixed livestock are the principal part of the farm activity will of necessity, have a lower percentage of absentee owner-operators. The municipalities east of the Red River and west of Lake Manitoba are typical examples.

An undetermined number of operators live south of the International Boundary, crossing into Canada long enough to farm lands in the municipalities adjacent to the boundary. Throughout the grain specialty areas of the southwest many farmers live in nearby towns and commute daily to the farm in the summer periods; others in this area operate more than the one farm on which they reside. In the vicinity of Swan River an unusually large number of farmers reside in the town, combining part-time employment with agricultural activities (40).

Of unusual interest is the large percentage recorded in the upper Interlake (Bifrost and Fisher) who engage in fishing during the winter period and in farming in the summer, yet reside in settlements such as Arborg and Riverton. In the Red River plain MacDonald Municipality (40) stands out as an area of high incidence of absentee owner-operators. In many cases these reside in Winnipeg, and some are businessmen who regard the farm as an investment.

Percent of Tenant-Operated Farms (25D)

In the Census of Canada four classes of farm tenure are recognized: Owner-operated, tenant-operated, part-owner and part-tenant operated, and manager-operated farms. The relative proportion of each since 1921 are represented in the following table:

FARMS CLASSIFIED BY TENURE—1921 TO 1956
(Agriculture Census 1956; Manitoba Bul. 2-7 Table 2)

Classification	1921		1931		1941		1951		1956	
	Number	%	Number	%	Number	%	Number	%	Number	%
Owner	43,169	81	37,769	70	38,292	66	37,184	71	33,950	69
Tenant	6,053	11	9,857	18	10,986	19	5,062	10	4,325	9
Part-Owner, Part-Tenant	3,549	7	6,369	12	8,367	14	9,780	19	10,519	21
Manager	481	.9	204	.4	378	.7	357	.7	407	.3

The proportion of owners to tenants in Manitoba has been the highest of the Prairie Provinces for the past two decades. After reaching a peak in 1941 the number and proportion of tenants consistently declined to the present low of only 9 percent of all farms, considerably lower than the figures for Saskatchewan and Alberta.

The pattern of tenancy conforms primarily to the type of farming, and secondarily to the concentration of certain ethnic groups. Along the fringe of settlement, subsistence farms with considerable dependence on livestock is the rule. Except in the vicinity of Lake Manitoba, farm units are small, ranging from 160 to 320 acres. In the history of settlement, these farms have been the latest to be pre-empted (pages 28-29), and are predominantly Ukrainian (plate 17). The Ukrainian settler, recently arrived from Europe where tenancy was high and land ownership the privilege of the wealthy, was eager to own his own farm. Moreover, as holdings were small and the productivity of the land was low, the cost of owning a farm on the fringe was relatively small (22A). The percent of tenancy shows a slight increase to the west of Lake Manitoba where government land is available on a rental basis.

From this outer fringe of low tenancy, the percentage gradually increases toward the south and west. Moderate increases are recorded where mixed farming is predominant, although the Mennonite settlements east and west of the Red River are low for reasons related to the attitude to farming as a way of life rather than a purely economic enterprise (note Rhineland (11) and Stanley (10) with 8 to 12 percent tenancy). The high rate of tenancy in Lorne (22) may be related to the custom among settlers of Belgian origin for the parents to retain title to the land while the farming is done by the sons. The cattle-raising farms along the Saskatchewan boundary show a low rate of tenancy as do those of Ukrainian settlement tributary to the "mountains".

But in the extreme south, two tiers of municipalities along the U.S. boundary show percentages ranging from 12 to 40. A north-south axis from Turtle Mountain to Riding Mountain also appears as a belt of above average tenant-farming. This conforms to the extensive grain farms (plate 18), with large units (20A) and high capitalization in land and machinery (22E and 23A). In order to maintain an economic unit, farmers were obliged to rent land, often entire farms, in order to expand their capital investment in machinery. Added to this is the custom of a father renting to his sons in order to keep the farm in the family and have a secure income in old age.

The crop-sharing rental agreement as usually practised on grain farms has made it easier to rent this type of farm than the livestock farm. The tradition of the farm as a way of life has never been as strong in the southwest, so that the younger generation moved rapidly to the city to seek their fortune and the aging parents, faced with retirement, prefer to rent the farm as a continuing source of income and basis of security. To what extent American farmers rent land in those municipalities is not known, but this may well be an additional factor.

Percent of Part Owner—Part Tenant Farms (24E)

In this category of tenure the farmer, besides owning land, has added to his holdings by renting additional acreage. It will be noted from the above table that this tendency has steadily increased. In many cases, the rental agreement used involves the right to purchase. In the large grain farms in the southwest, the need for capital equipment as well as land made renting of the latter more attractive. In areas of high percentage change in farm numbers (19C), abandoned properties were secured through rental either from the municipality or the owner.

In the vicinity of Lakes Manitoba and Dauphin the government owns large tracts of meadow land suited for pasture or hay. Cattle farmers have secured this land under lease. Similar tenure applies to the sandy soils in the vicinity of the Spruce Woods Forest Reserve.

The tendency to acquire land by rental agreement between father and son is characteristic of the Mennonite municipalities (especially Rhineland) in the southern Red River valley where pressure on available land is intense and value per acre is high (22F).

Percent of Owner-Operated Farms (25F)

Sixty-nine percent of all farmers own their holdings in entirety. If the 21 percent who own land and rent additional land were added to this group, the total would reach 90 percent. Pride in ownership of land and the desirability of title to land is fundamental in the philosophy of the Manitoba farmer. The pattern is, in general, the complement of that of tenant-operated farms (24D). The desire for ownership and independence is a trait of the Ukrainian farmer who came last and settled on the frontier. Land was cheap and holdings small.

The percentage of ownership decreases at a uniform rate to the south where the grain farming tradition of large holdings, together with a large capital investment in machinery renders it more difficult and even undesirable to own all the land required by an economic unit. Where land is good only for pasture, the pattern is one of rental, especially under government leasing arrangements along the frontier.

A

AVERAGE NUMBER of PERSONS per FARM

3·0 to 3·5
3·6 to 4·0
4·1 to 4·5
4·6 to 5·0
5·1 to 5·5
5·6 to 6·0
6·0 and over

DBS Census 1956

20 0 20 40 60 Miles

B

PERCENT CHANGE in FARM POPULATION 1941–1956

Increase
0 to 8
8 and over

Decrease
0 to 8
8 to 16
16 to 24
24 and over

20 0 20 40 60 Miles

C

PERCENT of FARMS with NON-RESIDENT OPERATORS

0 to 4
4 to 8
8 to 12
12 to 16
16 to 20
20 to 24

DBS Census 1956

20 0 20 40 60 Miles

D

PERCENT of TENANT-OPERATED FARMS

0 to 4
4 to 8
8 to 12
12 to 16
16 to 20
20 to 24
24 to 40

DBS Census 1956

20 0 20 40 60 Miles

E

PERCENT of PART-OWNER PART-TENANT FARMS

4 to 12
12 to 18
18 to 24
24 to 30
30 to 36
36 and over

DBS Census 1956

20 0 20 40 60 Miles

F

PERCENT of OWNER-OPERATED FARMS

30 to 40
40 to 50
50 to 60
60 to 70
70 to 80
80 to 90

DBS Census 1956

20 0 20 40 60 Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

WATER RESOURCES and FLOOD CONTROL

Manitoba is a land of rivers and lakes; over 250,000 square miles is covered by water. The drainage pattern has been shaped by continental glaciation. The large lakes are remnants of Lake Agassiz, which in glacial times extended over a major portion of what is now Manitoba. Most of Manitoba's waters drain into Hudson Bay via a complicated drainage pattern. Lake Winnipeg, which serves as the gathering place, receives drainage from the south via the Red River, which is the master stream of the prairies and park lands of the south; from the east and southeast via the streams running off the Precambrian Shield; and from the west via the Saskatchewan River. The outlet from Lake Winnipeg is the Nelson River, which reaches Hudson Bay after providing some of the province's largest potential hydro-electric sites (plate 26). Only the northern one-third of Manitoba does not lie within this intricate drainage system. Its two rivers, which flow directly to Hudson Bay, are the Churchill and the Seal (plate 1).

The regimen of streams draining the prairie part of Manitoba differ substantially from that of the streams running off the Precambrian Shield. The former are subject to extreme fluctuations in flow, as illustrated in the graphs below. The steadier flow of the Winnipeg River (the largest river to the east of Lake Winnipeg) and other rivers of the Shield makes them more suitable to the production of hydro power.

Ground Water

No detailed inventory of ground-water supplies has been taken at this time. Knowledge gained from the experience of individuals and communities that have dug or drilled wells reveals that a moderate amount of water can be found underground in many parts of the Province. In some areas, however, this water is excessively saline and, consequently, of little use for commercial or domestic purposes.

Reasonably large volumes of slightly saline water are available from deep wells in the Greater Winnipeg area. This water might be useful for certain types of industrial cooling. Large volumes of ground water have also been found in the Carberry and Piney districts. Along the western shore of Lake Winnipeg, at Gimli and near Teulon, artesian wells of considerable volume flow regularly.

The map shows that several Manitoba communities depend on wells for their water supply. These supplies are adequate and generally of good quality. The per capita consumption is indicated by the relative size of the circles. A large consumption indicates the relative importance of industrial use at such centres as Pine Falls.

Water Uses

Municipal Supply—Many communities, including the municipalities of Greater Winnipeg, draw domestic and commercial water supplies from surface waters, some of which are dammed for that purpose. Reservoirs presently under the control of the Province are located at Morden, Rivers, Minnedosa, Neepawa, and Boissevain. The Greater Winnipeg industrial, commercial and domestic water supply is brought from Shoal Lake via a 94.6-mile gravity-flow aqueduct. The metropolitan area can draw a potential volume of 100 million gallons per day from this source.

Recreational Use—Some controlled water supplies are used for recreational purposes at Morden, Portage la Prairie, Rivers, Rock Lake, Killarney, Roblin, Beausejour, and Minnedosa. The Whiteshell Forest Reserve, with its numerous lakes and rivers, Riding Mountain National Park, Lake Winnipeg, and Lake Manitoba are very popular summer resorts, primarily because they provide bodies of water suitable for sports and fishing. In some areas, small dams and minor water-control works have been constructed to protect waterfowl.

Irrigation—Only limited irrigation is carried on in Manitoba at the present time. Sprinklers are used to irrigate vegetable crops in the Red River valley. The water is drawn directly from the river. Although Manitoba's annual rainfall is generally adequate for all agricultural crops, the variation in seasonal rainfall occasionally results in losses of some of the more demanding crop types. Consequently, the feasibility of irrigation is exciting considerable interest at the present time. Although research has not yet revealed conclusive results, it is believed that the Morden-Winkler-Carman region is partially irrigable, as are certain areas in the Portage la Prairie and Melita districts.

Flooding and Flood Control

The Red River valley, with its broad floodplain built up by river deposits, is subject to extensive flooding. One of the most severe floods in the history of the region occurred in 1950 (see plate 25). Other major floods occurred in 1826, 1852, 1861, 1882, 1904, and 1916. The width and flatness of the valley and the meandering route of the stream between the International Boundary and Winnipeg make flood control difficult, especially for the towns of Emerson and Morris. After the 1950 flood, the City of Winnipeg built dykes and proposed a flood-diversion ditch that would run east of the city. The alignment of the proposed floodway, which would carry excess river water during peak flow periods, is shown on the map.

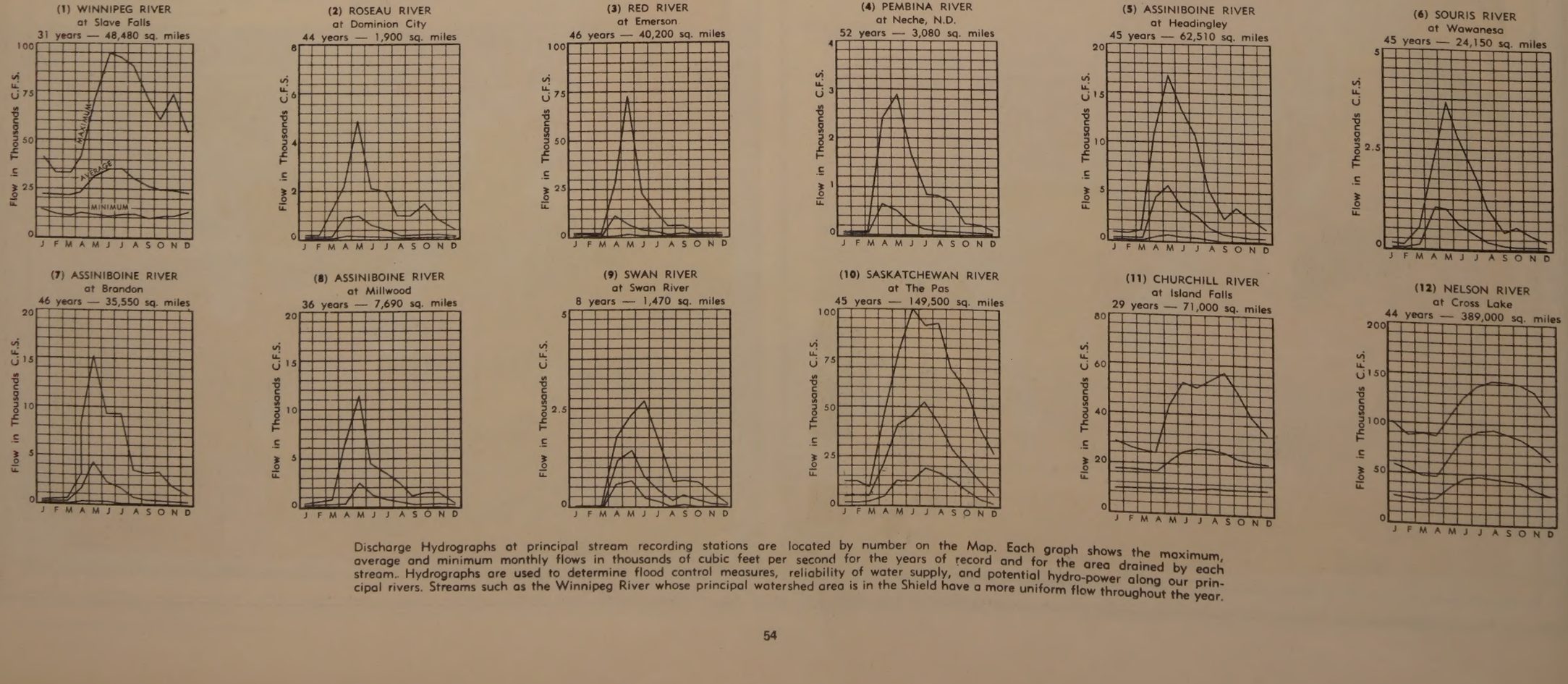
The Assiniboine River, which joins the Red River at Winnipeg, tends to reach its peak flow at about the same time as the master stream (see graphs). The flood hazard in the lower reaches of the Assiniboine has been reduced by dikes stretching eastward from the Portage la Prairie area, as shown on the map. Diversion of flood waters from Portage la Prairie northward into Lake Manitoba has been proposed. Other plans call for construction of two dams, one near Russell and one west of Portage la Prairie, to retain the run-off from the watershed during peak flow periods. Flooding in the lower reaches of the river thus would be reduced. Floods in the areas shown in the Whitewater Lake and Oak Lake districts of southwestern Manitoba are normally caused by excessive rainfall and local drainage problems, but they are not considered severe.

Drainage

The map shows the canals of the organized drainage districts in Manitoba. The first organized drainage in the province began in 1895, after passage of the Land Drainage Act, which provided for the setting off of blocks of land requiring ditching in order to be productive.

At the present time, 2.2 million acres of land are under drainage. The province provides consulting and co-ordinating services, including complete engineering, and pays one-third of the maintenance and construction costs. All drainage, however, is under the control of the municipalities, subject to the approval of the provincial co-ordinator.

Manitoba is well endowed with water resources, such as the Nelson River, pictured below, now site of a large hydro electric power station being built to serve new northern mining developments.



Discharge Hydrographs at principal stream recording stations are located by number on the Map. Each graph shows the maximum, average and minimum monthly flows in thousands of cubic feet per second for the years of record and for the area drained by each stream. Hydrographs are used to determine flood control measures, reliability of water supply, and potential hydro-power along our principal rivers. Streams such as the Winnipeg River whose principal watershed area is in the Shield have a more uniform flow throughout the year.

WATER RESOURCES

SELECTED GAUGING STATIONS

based on period of record

LAKE LEVEL STATIONS

TYPES OF RECORD	PERIOD OF RECORD
Summer and Winter ▲	20 to 30 years
Summer and Winter △	10 to 20 years
Summer only ▲	5 to 10 years

STREAM FLOW STATIONS

Summer and Winter ●	20 to 30 years
Summer and Winter ○	10 to 20 years
Summer only ●	5 to 20 years

WATER CONSUMPTION

Industrial and Domestic

Average daily consumption in gallons per capita

WATER SOURCES

W — Well L — Lake

S — Stream R — Reservoir

Greater Winnipeg aqueduct

200 150 100 50 25

DRAINAGE and FLOOD CONTROL

Drains (generalized) Dikes

DIVERSIONS Existing Proposed

AREAS RECENTLY FLOODED

GRAND RAPIDS RESERVOIR AREA

DRAINAGE BASINS

SEAL RIVER

CHURCHILL RIVER

HAYES RIVER

OTHERS

NELSON RIVER

1 Nelson River

2 Saskatchewan River

3 Central Lakes Section

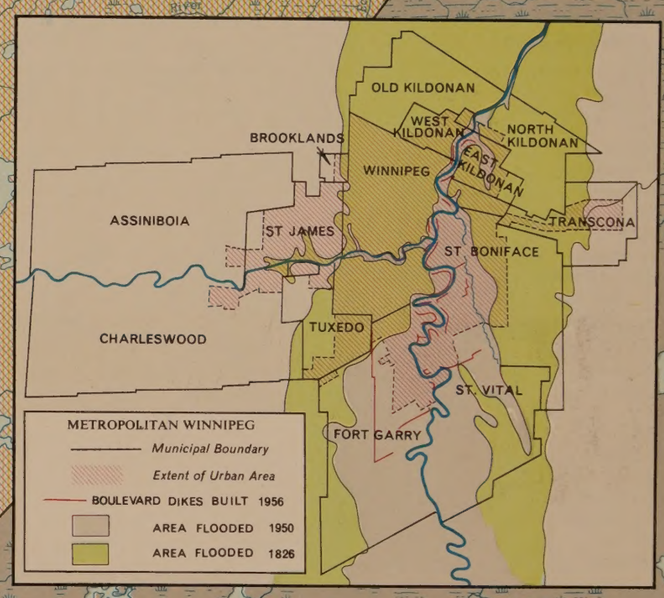
4 Assiniboine River

5 Red River

6 Winnipeg River

40 20 0 40 80 120

Scale in Miles



PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

ELECTRIC POWER

Manitoba has long depended heavily on electric power as a source of energy. Its per capita consumption of electricity is higher than anywhere else in the world, and the cost of generation is among the lowest on the continent. The province is indeed fortunate to be endowed with hydro-electric sites in both the south and the north. In the developed southern part of the province, demand has been met by the harnessing of the Winnipeg River, supplemented by power from two steam plants. In the vast undeveloped north, there are many potential hydro-electric sites, some of which will play an important part in the development of natural resources.

In 1692, Henry Kelsey, the first explorer of northern Manitoba, noted in his diary that the rivers north of the 53rd parallel were "mighty with falls". These falls and rapids, obstacles to Kelsey's travels, now represent a potential hydro-electric output estimated at 4 million kilowatts of continuously available power. The principal sources of this great potential power are three rivers of northern Manitoba: the Nelson, the Churchill, and the Seal. The Nelson River alone offers more than three times the total generating capacity in Manitoba (1959) while the potential output of sites on the Churchill River is enough to meet all of the current requirements of the province.

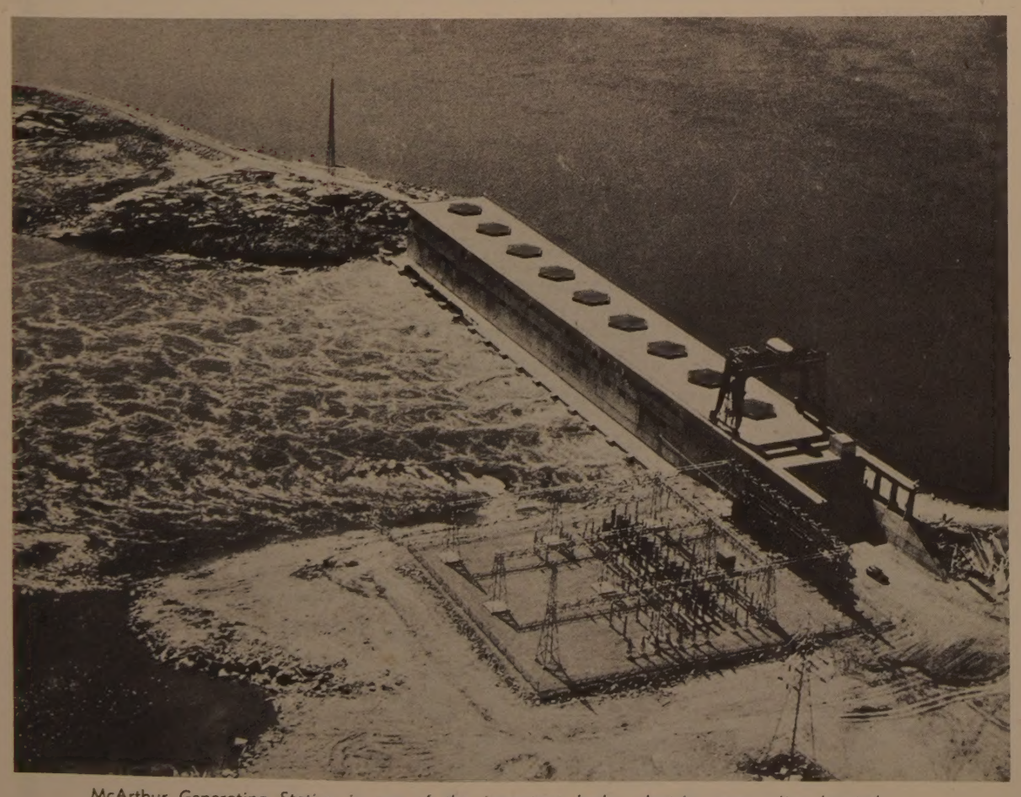
Some of this potential power is being transformed into reality with the construction of the Kelsey station on the Nelson River, the first hydro-electric generating station in northern Manitoba. About one-half of its potential 337,500 kw will be used in the initial development of the site. The station will be operated by remote control from the town of Thompson, 58 miles away. A multi-million-dollar metal mining and processing operation will be the principal consumer of Kelsey power, but it is anticipated that other industries will develop in the area.

There are several other possible sites for hydro stations on the reaches of the Nelson River. For example, south of the Kelsey station and north of Lake Winnipeg are Whiskey Jack, Whitemud Falls, and Red Rock Rapids, with a combined potential capacity of 532,000 kw; and north of Kelsey are Birthday Rapids, Upper and Lower Gull Rapids, Big Hill Rapids, Kettle Rapids, Long Spruce Rapids, Lower Limestone Rapids, and Above Gillam Island, with a combined potential output of about 2,815,000 kw.

On the Churchill River, which winds its way in a northeasterly course from the Manitoba-Saskatchewan boundary into Hudson Bay, are ten sites with combined potential power of about 1,245,000 kw. However, the high development costs, remoteness from load centres, and line losses inherent in long distance high-voltage transmission would make development of the sites uneconomic at the present time.

DEVELOPED AND POTENTIAL ELECTRIC POWER SITES IN MANITOBA

	Head in Feet	Normal Winter Capacity
WINNIPEG RIVER (Developed)		
1. Pointe du Bois	46	72,000 kw.
2. Slave Falls	30	68,000 kw.
3. Seven Sisters	61	150,000 kw.
4. McArthur Falls	23	56,000 kw.
5. Great Falls	58	132,000 kw.
6. Pine Falls	37	82,000 kw.
		Peak h.p. available at 80% efficiency and 60% load factor
NELSON RIVER (Potential)		
7. Whiskey Jack	25	186,000
8. Whitemud Falls	41	305,000
9. Red Rock Rapids	30	223,000
10. Grand Rapid	50	371,000
11. Birthday Rapids	33	245,000
12. Upper Gull Rapids	24	178,000
13. Lower Gull Rapids	34	253,000
14. Big Hill Rapids	38	282,000
15. Kettle Rapids	54	401,000
16. Long Spruce Rapids	69	513,000
17. Lower Limestone Rapids	186	1,381,000
18. Above Gillam Island	70	520,000
CHURCHILL RIVER (Potential)		
19. Island Falls (Operating)	50	125,500
20. Pukatawagan Falls	30	68,000
21. Granville Falls	40	91,000
22. Missi Falls	40	91,000
23. God's Rapids	40	91,000
24. Fidler Lake Rapids	120	272,000
25. Head of Upper Canyon	155	352,000
26. Above Lower Canyon	130	293,000
27. Below Lower Canyon	75	170,000
28. Below Old Beach	70	159,000
29. Limestone Rapids	40	91,000
SEAL RIVER (Potential)		
30. North Seal River		
31. Below Shebanei Lake—Site 1		
32. Below Shebanei Lake—Site 2		Only preliminary field work and aerial reconnaissance have been carried out. The river has a head of 600 feet and will likely yield 150,000 h.p.
33. Above Great Island		
34. Great Island		
35. Below Great Island		
36. Between Great Island and Hudson Bay		
OTHER HYDRO SITES		
37. Grand Rapids	120	450,000
38. Kanuchuan	18	1,900
39. Laurie River—Site No. 1	55	5,222
40. Laurie River—Site No. 2	55	5,222
10. Kelsey (under development)	50	168,750
Brandon (Thermal)	.....	132,000
Selkirk (Thermal)	.....	132,000
Amy Street (Thermal)	.....	51,000
Town of Churchill (Diesel)	.....	4,050



McArthur Generating Station is one of the important hydro electric power sites located on the Winnipeg River in the southeast portion of the province.

On the Seal, the most northerly of Manitoba's rivers considered for power development, only preliminary work has been carried out. Along a length of some 100 miles are seven site possibilities with a combined capacity of about 112,000 kw. These sites, however, are small, presumably expensive to develop, and too distant from any load potential other than at Churchill.

Another potentially great site is at Grand Rapids, at the mouth of the Saskatchewan River. Construction of a plant at this site is underway and, when completed, it will be the largest hydro-electric station in the province with a capacity of 358,000 kw. Since it is situated closer to the main load centre in southern Manitoba, Grand Rapids will lend itself better to high-voltage transmission to the south than would some of the sites in the north.

Full development of northern Manitoba's resources, however, depends largely on economic transmission to southern Manitoba (where the greatest provincial demand now exists) and interconnection with the Manitoba supply system. Although substantial additional quantities can be consumed in northern Manitoba with the development of local markets, the region will have little prospect of consuming an amount of power equal to approximately seven times the present provincial demand.

The demands for power in southern Manitoba in 1956 represented almost the full capacity of the Winnipeg River hydro system, which is now the main power source. To augment the system's resources, thermal generating stations have been built near the main centers of population. The station at Brandon has a rated capacity of four 33,000 kw units, and the initial stage of the plant at Selkirk includes two 66,000 kw units. Plans are also in progress to expand this system beyond the capacity provided for by the new additions. The Manitoba Hydro-Electric Board, which is the generation and high-voltage transmission authority for the province, owns and operates the two thermal-electric stations, as well as four hydro-electric stations on the Winnipeg River.

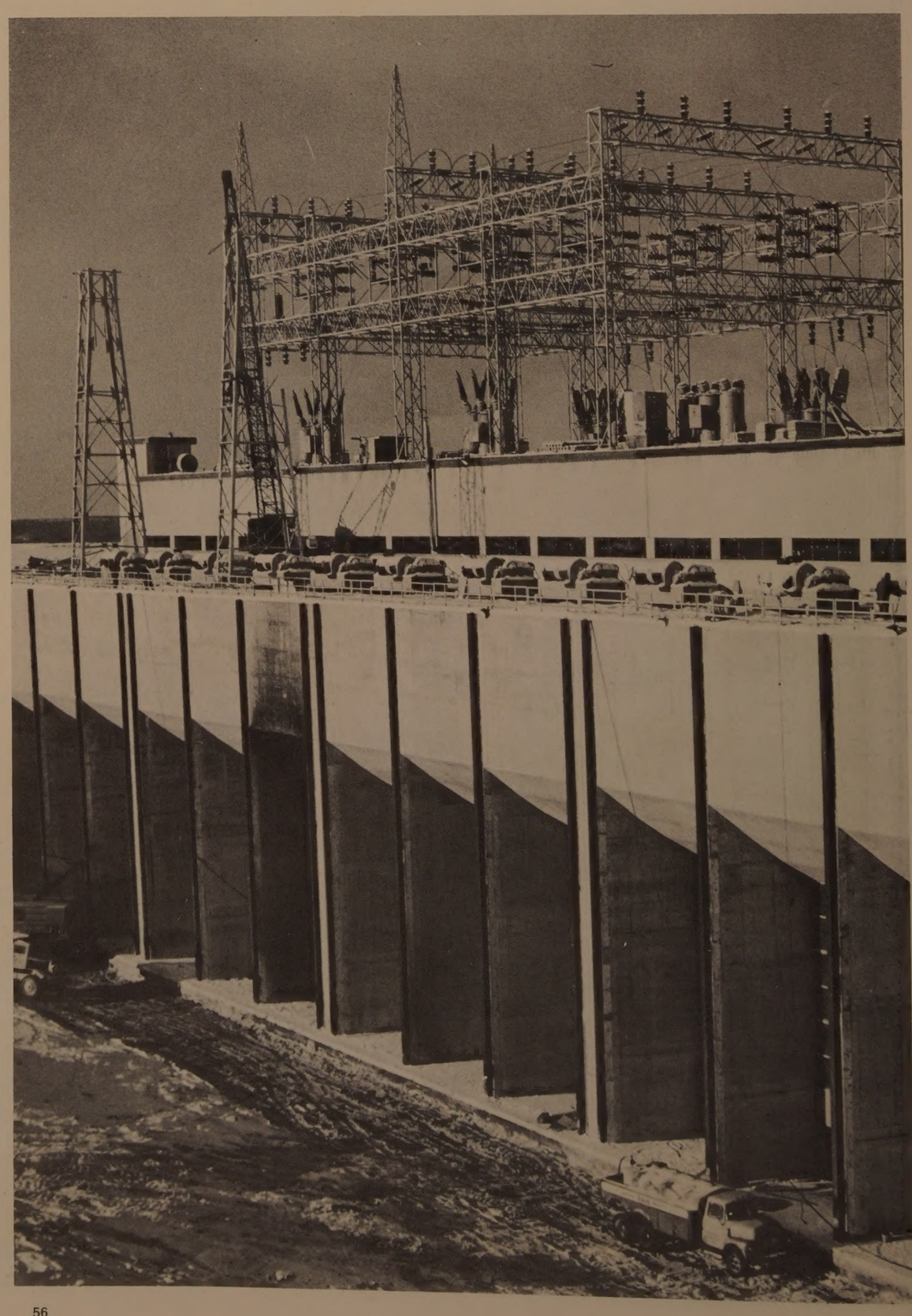
The City of Winnipeg Hydro-Electric System is owned by the city of Winnipeg and distributes power within the city. This utility has two hydro stations on the Winnipeg River, Slave Falls and Point du Bois, with a combined capacity of 140,000 kw. These plants are used to produce part of the power required within the city and the balance is purchased from the Hydro-Electric Board. City Hydro also generates a small amount of electricity at its Amy Street thermal plant in Winnipeg.

The remainder of the province, including the suburbs of Metropolitan Winnipeg, is served by the Manitoba Power Commission. The Commission is a distribution body only, has no generation facilities of any size, and purchases almost its entire requirement from the Hydro-Electric Board. In recent years it has concentrated on extension of its farm electrification program and now has service available to over 90 percent of the farms in the province. In addition, the power needs of over 525 towns, villages, and hamlets are filled by the Commission.

Power is delivered by the Hydro-Electric Board at its "common bus" or distribution circuit at 110,000 volts and is then transmitted by the Power Commission at 66,000 volts (24,000 volts in suburban Winnipeg) to its various transformer stations. Here, it is stepped down and delivered to the domestic consumer at 110 volts and 60 cycles.

An additional small quantity of power is generated in Manitoba by private interests, primarily for their own use. The Sherritt Gordon Mines Limited owns and operates two low-capacity hydro stations on the Laurie River, a tributary of the Churchill, and is the largest private generating body in the province.

A new era is dawning in the power industry in Canada. Considerable experimental work is being carried out in the field of nuclear generation, and Atomic Energy of Canada Limited is embarking on a multi-million dollar nuclear energy and research centre in Manitoba. The development, to be situated on 11,000 acres on the Winnipeg River near Lac du Bonnet, will further explore this relatively new concept in electric power generation.



The Kelsey Power Station under construction at Grand Rapid on the Nelson River will provide power for the new multi-million dollar International Nickel Company mining development at Thompson.

ELECTRIC POWER

HYDRO–ELECTRIC SITES

Developed Site

Potential Site

THERMAL–ELECTRIC SITES

Steam Plant

Diesel Plant

Developed Dam Site

Potential Dam Site

Capacity of all developed sites based on installed horsepower
Capacity of all undeveloped sites based on continuous 24 hour power at 80 per cent efficiency

8000 HP 30000 HP 120000 HP 240000 HP 865000 HP

Volumes of spheres proportional to horsepower

ELECTRIC TRANSMISSION LINES

115 KV or more

66 KV

33 KV

12 KV

8 KV

② Number of Circuits

Numbers at power sites refer to names of sites indicated on text page e.g. 5 represents Great Falls

EXTENT of RURAL ELECTRIFICATION

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

FOREST RESOURCES

Although it is called one of the Prairie Provinces, Manitoba is far from being a treeless territory; it has a forested area of 129,455 square miles, which represents 60 percent of the total land area of the province (plate 10). Not all of this land is timber-producing, however, because some of it is located near the limit of tree growth, some of it is located on very shallow soil and some of it suffers from poor drainage. Productive forest land constitutes 26.3 percent of the province's land area; potentially productive forest land, 4.3 percent; nonproductive forest land, 30.5 percent; and permanently nonforested land (which includes all of that used for agriculture), 38.9 percent (table 1). The Provincial Government holds most of the 36 million acres of productive forest. The percentage that is in private hands consists chiefly of farm woodlots.

FOREST AREA CLASSIFICATION BY TENURE
PROVINCE OF MANITOBA

CLASS OF AREA	CROWN						INDIAN RESERVES		PATENTED		TOTAL	
	Provincial		Riding Mountain National Park		Total Crown							
	Acres	% of land	Acres	% of land	Acres	% of land	Acres	% of land	Acres	% of land	Acres	% of land
PRODUCTIVE FOREST LAND 1.	32,725,978	28.6	578,770	78.5	33,304,748	28.9	214,312	39.6	2,100,811	10.6	35,619,871	26.3
POTENTIALLY PRODUCTIVE FOREST LAND 2.	2,604,408	2.3	100,288	13.6	2,704,696	2.3	43,419	8.0	3,129,104	15.8	5,877,219	4.3
NONPRODUCTIVE FOREST 3.	41,179,201	36.0	14,771	2.0	41,193,972	35.8	107,170	19.8	52,963	.3	41,354,105	30.5
PERMANENTLY NONFORESTED LAND 4.	37,938,519	33.1	43,807	5.9	37,982,326	33.0	176,264	32.6	14,526,215	73.3	52,684,805	38.9
TOTAL LAND	114,448,106	100.0	737,636	100.0	115,185,742	100.0	541,165	100.0	19,809,093	100.0	135,536,000	100.0

1. Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.
2. Cut-over, burn, brush or grassland, not now supporting productive forest, but capable of doing so.
3. Land with a forest cover such as treed muskeg, treed rock, and willow or alder swamp, but incapable of producing a forest crop of merchantable size within a reasonable time.
4. Includes marsh, muskeg, rock, tundra, meadow, developed agricultural land, urban areas, roads, and railroads. In general, lands not expected to produce forest of any kind.

Forestry ranks fourth among Manitoba's industries, with a primary production value of $20 million per year. Forest-based enterprises are the sole support of many small towns and communities. In addition to wood's obvious importance in houses and furniture, wood fibre is the raw material for paper, paperboard, and numerous other cellulosic products, such as synthetic fabrics.

Forests contribute to the economic and social well-being of Manitoba in many other ways. They protect watersheds, guard against erosion of valuable soils, prevent costly floods, and conserve vital water supplies. Abounding in fish and game, they are visited each year by large numbers of Manitobans and tourists, seeking rest and recreation.

The principal tree species are spruce, aspen, jack pine, poplar, balsam fir, white birch and tamarack. The total volume of wood in these forests is 10.3 billion cubic feet. Soft woods, commonly called conifers, total 7.6 billion cubic feet, while hard woods (broad-leaf trees) account for the remaining 2.7 billion cubic feet (table 2).

SOFTWOOD AND HARDWOOD VOLUME BY SPECIES AND SIZE CLASSES
PROVINCE OF MANITOBA

SPECIES	*CUNITS BY DIAMETER CLASSES						SAW TIMBER 10" and over M ft. b.m.
	TOTAL		4"-9" D.B.H.		10" D.B.H.		
	Volume	Percent	Volume	Percent	Volume	Percent	
White spruce	17,681,051	17	10,132,900	13	7,548,151	33	3,396,668
Black spruce	36,705,125	36	34,152,797	42	2,552,328	11	1,147,385
Balsam fir	4,023,875	4	3,422,752	4	601,123	3	268,087
Jack pine	16,891,248	16	14,259,408	18	2,631,840	11	1,184,328
Tamarack	674,341	1	654,586	1	19,755	—	8,889
Cedar	103,103	—	80,633	—	22,470	—	10,111
TOTAL SOFTWOOD	76,078,743	74	62,703,076	78	13,375,667	58	6,015,468
Aspen	19,655,206	19	12,552,937	16	7,102,269	31	3,022,831
Balsam poplar	4,197,007	4	2,593,722	3	1,603,285	7	696,737
White birch	3,312,622	3	2,425,164	3	887,458	4	391,109
TOTAL HARDWOOD	27,164,835	26	17,571,823	22	9,593,012	42	4,110,677
ALL SPECIES	103,243,578	100	80,274,899	100	22,968,679	100	10,126,145

*One cunit equals 100 cubic feet of wood: one cord equals 85 cubic feet of wood.

The Forest Service has separated Manitoba's forest land into accessible and inaccessible zones, subdivided into fourteen "inventory districts".

1. SOUTHEASTERN DISTRICT. Often called the "wood box" because it formerly supplied fuel wood for Greater Winnipeg, the Southeastern District receives 22 inches of precipitation, which favours excellent growth of all species. Eastern species (e.g. white pine, red pine, cedar, large-tooth aspen and hop-hornbeam) exotic to the remainder of Manitoba grow in this area. Black spruce is the most plentiful species, followed by aspen and jack pine. Still an important source of spruce and pine pulpwood, the area also produces pine and cedar poles, posts and ties. Because of its accessibility and its closeness to major markets, it is the most important timber area in Manitoba (see also Natural Vegetation, plate 10).

2. WINNIPEG RIVER DISTRICT. Typified by an undulating landscape, this section is ideally suited to parks and recreation. Excellent stands of jack pine, black spruce, aspen and white poplar grow here. Lumber and pulpwood are its chief commodities.

3. LOWLANDS SOUTH DISTRICT. This area is composed of low, jack pine covered sand plains and black spruce swamps. Because of its accessibility to markets, it has been fully developed, but fire and overcutting have considerably depleted its productivity.

4. AGRICULTURAL DISTRICT. Since the area is devoted primarily to agriculture, its commercial timber is of little value. Non-agricultural areas have been isolated to form the Spruce Woods and Turtle Mountain Forest Reserves for soil conservation and recreation. Aspen, along with remnants of conifers, oak, elm and ash, comprise the wooded sections.

5. RIDING MOUNTAIN DISTRICT. Rolling, aspen-covered hills interspersed with lakes form the Riding Mountain National Park. Farmlands surround the area, leaving the exposed escarpment as forest. Farmers cut poplar and minor quantities of white spruce, black spruce and jack pine.

6. INTERLAKE-WINNIPEGOSIS DISTRICT. Consisting of gentle ridges interspersed with open grass swamps, this district had good forest stands at one time, but they have been devastated by fire. Spruce lumber is the most important forest product. Because of transportation costs, pulpwood is marginal. Farming and ranching are being extended to utilize the burnt-over forest lands.

7. DUCK MOUNTAIN DISTRICT. Generally very heavily wooded with aspen, white spruce, black spruce, jack pine and balsam, this Forest Reserve is similar to Riding Mountain, but contains a higher percentage of conifers. Its major products are spruce and aspen lumber and pulpwood.

8. PORCUPINE DISTRICT. Similar to the previous mountain areas, but containing a higher proportion of conifers, Porcupine Mountain was once an important source of white spruce lumber. Now, however, black spruce is the major species, followed by jack pine, aspen and white spruce. The district is still an important producer of lumber and pulpwood.

9. NELSON RIVER (EASTERN) DISTRICT. Containing good forests of black spruce and jack pine, this area remains cut off from all forms of transportation; consequently, it has not been developed.

10. NELSON RIVER (CENTRAL) DISTRICT. As a producer of forest products, this district has the greatest potential of any in Manitoba. It has enough pulpwood to sustain the largest types of pulp mills, but its forest products have not been developed extensively. Its forests are comprised of black spruce, jack pine, white spruce and aspen.

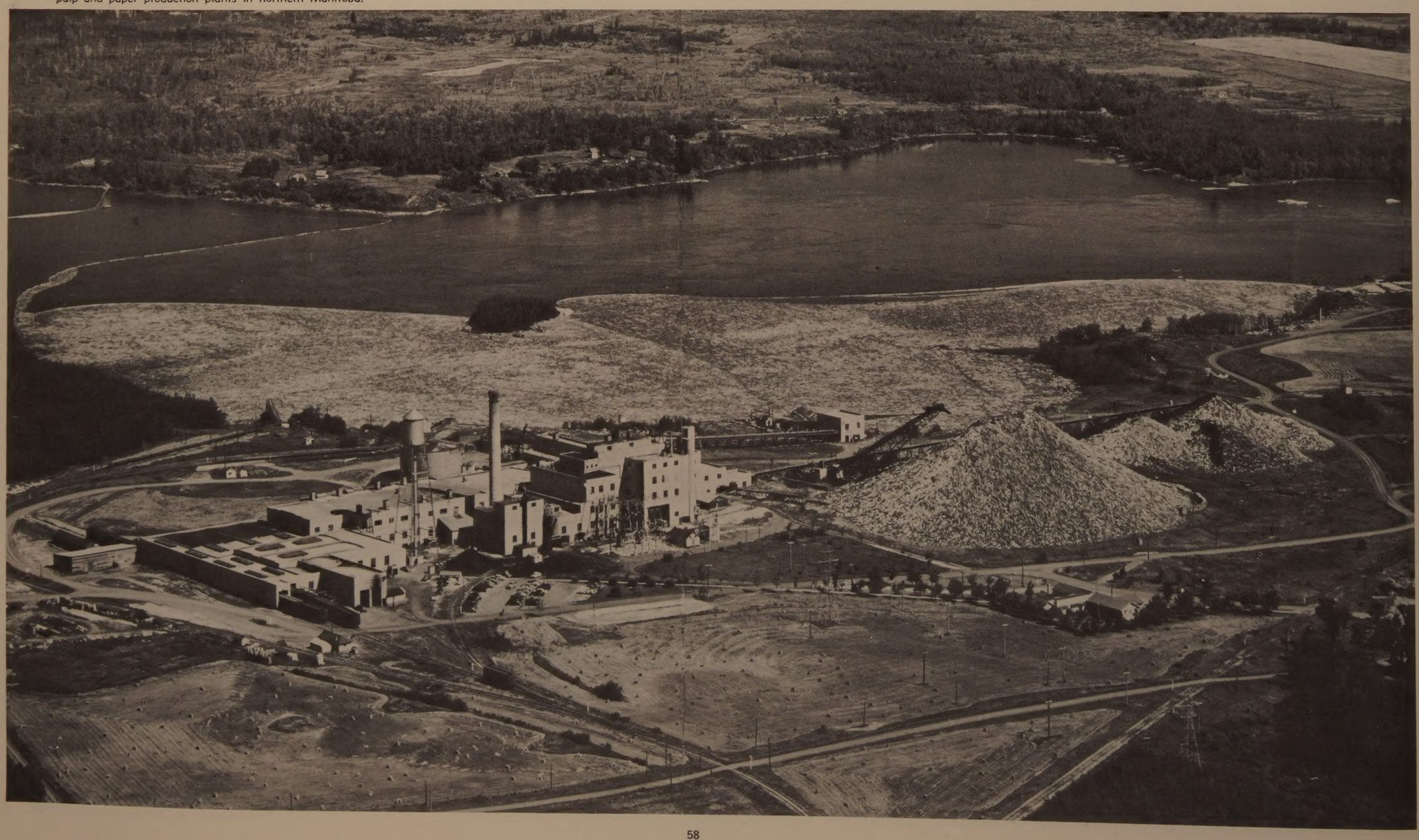
11. LOWLANDS NORTH DISTRICT. A fairly level plain underlain by limestone and dotted with large alluvial marshes along the Saskatchewan River, this section contains extremely young stands, primarily because of a succession of fires. In order of volume, white spruce, black spruce and aspen predominate. The area has high potential as a producer of pulpwood.

12. NORTHERN MINING DISTRICT. This Precambrian area is capable of producing good forests, but fires have limited its yield. The major species are black spruce and jack pine, with scattered patches of white spruce and aspen. This district has produced minor quantities of lumber ties and pulpwood.

13. INACCESSIBLE EAST DISTRICT. Extensive stands of mature spruce and pine grow here, but fires break out frequently. With the extension of transportation arteries, this may become an important forest-products area.

14. INACCESSIBLE NORTH DISTRICT. Even though it has suffered from persistent fires, this district has good natural regeneration that helps to restock the jack pine, aspen and black spruce. It will acquire a forest-products potential in the distant future when smaller wood can be economically utilized.

Newsprint is an important Manitoba forest product and opportunities exist for large new pulp and paper production plants in northern Manitoba.



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FOREST RESOURCES by INVENTORY DISTRICTS

NAMES OF INVENTORY DISTRICTS

1 Southeastern
2 Winnipeg River
3 Lowlands-Southeastern
4 Agricultural
5 Riding Mountain
6 Interlake-Winnipegosis
7 Duck Mountain
8 Porcupine
9 Nelson River-Eastern
10 Nelson River-Central
11 Lowlands-North
12 Northern Mining
13 Inaccessible-East
14 Inaccessible-North

SPECIES

Percentage distribution of species by volume for each Inventory District

SOFTWOODS
White Spruce
Black Spruce
Balsam
Jackpine
Others

HARDWOODS
Poplar
Birch
Others

VOLUME

(1000's of cubic feet)

Volume of merchantible timber is proportional to the areas of circles

1500
1000
500
250

AVERAGE VOLUME OF MERCHANTABLE TIMBER

(per square mile of land area — in 1000's of cubic feet)

under 15
80 to 90
180 to 240
30 to 75
130 to 145
over 400
Non-Commercial
Tundra

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

FOREST ADMINISTRATION and UTILIZATION

Organization

For policy, planning and statistics, the Forest Service, a branch of the Department of Mines and Natural Resources, is comprised of four main divisions: Timber Sales, Forest Management, Forest Protection, and Parks and Recreation.

Timber Sales' primary responsibility is self-explanatory. In fulfilling this function, the division uses three general methods: direct auction, sealed tenders, and settlers permits. Coincidentally, it also handles scaling, collection of revenues and the issuance of clearances.

Forest Management is responsible for the inventory of forest resources, cruising, mapping, preparation of management plans, silvi-culture, tree nurseries and planting. With the aid of a recently completed detailed inventory, cutting can now be established on the basis of sustained yield. Practically all areas which have been overcut, as well as those which are being cut, are now under management plans. Plans are now being formulated for areas that will be cut later in more marginal and inaccessible districts.

Forest Protection is assigned responsibility for fire protection and all its related activities, including towers, communications, and weather stations. This division also handles the construction of roads, trails and bridges in forest areas.

Parks and Recreation maintains roadside parks and campgrounds along the Trans-Canada highways, in addition to developing park and recreational facilities in Forest Reserves.

For the purpose of decentralized administration, the Forest Service has divided the province into five forest districts: the Northern, Western, Southern and Eastern, and the Whiteshell Forest Reserve (plate 28). These districts are further subdivided into a series of Ranger Districts, each primarily responsible for forest fire protection and reforestation.

Fire Protection

On the first of April each year, one of the largest observation units in Manitoba goes into operation. Composed of ninety-seven 80-foot steel lookout towers, the Forest Service lookout system operates at various locations throughout the province. The system is under the supervision of 60 Forest Rangers who are permanent members of the fire-fighting staff. This staff mans 39 permanent ranger stations that form the nucleus of an extensive radio system operated by the Forest Service.

During the fire season, the Forest Service has priority on the allocation of aircraft of the Manitoba Government Air Service. Two Otter and six Beaver aircraft are made available. Two planes are located at The Pas, one at Norway House, another at Thicket Portage, and the remaining four at the main base at Lac du Bonnet.

Because of uncontrollable factors such as lightning, it is not possible to prevent all Forest Fires. Consequently, a certain percentage of forest land is expected to burn. This is called "the acceptable area of burn". In Manitoba, this area amounts to 135,436 acres. The "acceptable area of burn" figures, which are computed from data based on the recently completed forest inventory, help to establish objectives for the Ranger Districts.

Reforestation

Manitoba is very fortunate that its forests, after being cut or burned, usually grow back into stands equal to those removed. In other areas, nature often has to be assisted in its work of regeneration by the leaving of seed trees, the partial cutting of the stand, or scarification of the ground to prepare a seed bed. When these methods fail, the only resort is to plant young trees.

Only token amounts of trees were planted from 1904 until 1950, when the government instituted a definite program of reforestation of large denuded areas. A nursery opened at Hadashville in 1953 is now producing about 1 million trees per year; it will be expanded to produce 5 million trees by 1965 and 10-12 million by 1970.

Forest Utilization

Manitoba's forest resources are most fully developed in the southern, more accessible parts of the province. The most important forest products are pulpwood and lumber which come from all the accessible areas. Manitoba timber is used to supply the consistent demands of the boxwood industry and the jack pine railroad tie market. Quantities of mine ties and mining timbers are produced for the Thompson nickel mining area. It is estimated that this operation alone will consume 14,000 cords of timber annually, a volume that will increase with new mineral development in other areas. Pulpwood logging operations near The Pas and Wabowden cut and ship rough and peeled spruce pulpwood to southern Manitoba and the midwestern United States.

Of major importance to the provincial economy is the Manitoba Paper Company at Pine Falls. Through a program of modernization, this company has been steadily building its output to the present level of 500 tons of newsprint per day.

Future Development

Recent economic and technical studies indicate further development will be centered around core industries established to take advantage of the abundant forest reserves in northern Manitoba. The main areas of importance for mill sites are: (1) The Nelson River, Lake Sipiwesk, and Cross Lake area, (2) The Pas region and (3) Churchill River region (plate 10).

The area along the Nelson River offers some of the best stands of timber in northern Manitoba. Another advantage of this region is the Kelsey hydro-electric development, a source of low-cost power and the reason for creating a large lake area enabling a substantial reduction in wood-gathering costs.

Abundant stands of mature timber along with low raw material and wood-gathering costs favour the establishment of a mill to produce high-grade market pulp for blending with hardwood and other short-fibred pulps, or an integrated pulp and paper operation. Approximately $35 million excluding the cost of woods, would have to be invested in a mill capable of producing 400 tons per day of bleached sulphate for Kraft paper, or in a sulphite pulp mill. Such an operation would use spruce, primarily, and lend itself to the integration of a manufacturing unit with the central milling operation using pulpwood-size poplar and jack pine. A $1 million hardboard plant capable of producing 60,000 square feet of ⅛ standard hardboard is being proposed to fill this capacity.

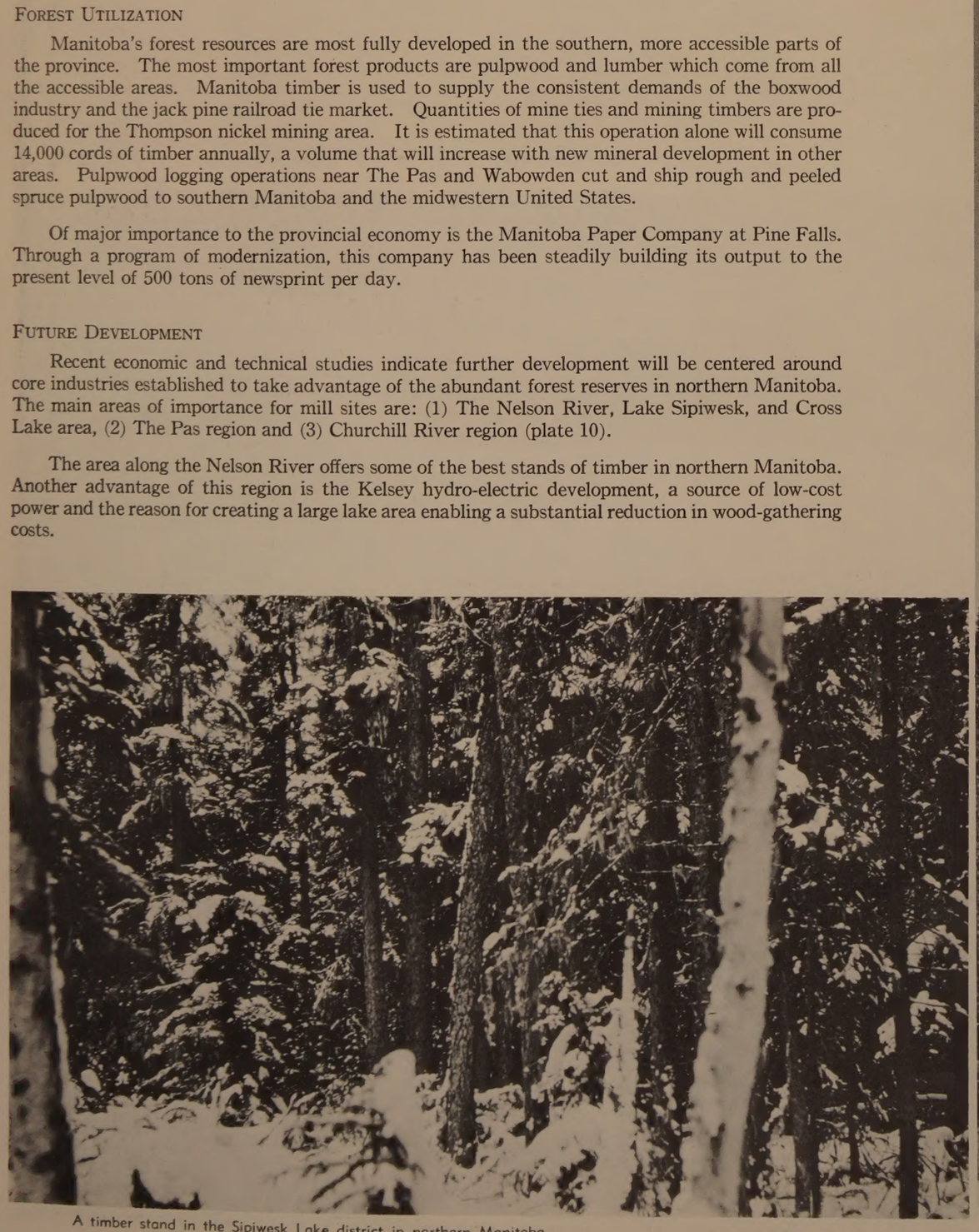
Maximum utilization of the resources in this region may also be realized through a complementary newsprint and Kraft pulp operation. Recent technical improvements have made possible the addition of as much as 30 percent hardwood pulp in newsprint production; this means that a portion of the pulp stock can be made up of jack pine and poplar. When fully organized on a commercial basis, the total operation would produce about 300 tons of newsprint and 100 tons of Kraft pulp per day.

The region around The Pas offers the greatest advantages to satellite industrial units. Important development possibilities within the next five to ten years are a small semi-chemical pulp mill or a hardboard mill, a plywood mill at The Pas, and a pulp and paper mill at Grand Rapids on the Saskatchewan River. The decision to proceed with a hydro-electric project at Grand Rapids should stimulate the establishment of these operations. Increasing transportation facilities will also provide additional incentive.

Another possibility in the vicinity of Grand Rapids is a combined insulation board-hardboard unit at an investment cost of approximately $6.5 million. In addition, the establishment of either a pulp or a hardboard plant can be expected to lead ultimately to the construction of a small sawmill and plywood unit for complete utilization of all wood materials.

The Churchill River region offers opportunities for a 150-ton-per-day semi-chemical pulp operation representing an investment of $10 million. Ample forest reserves are within economic transportation distance of a proposed site in the vicinity of Pukatawagan. As further timber resources in this region are made accessible, additional reserves will be available for both pulp and hardboard production.

Low-cost wood, technological improvements in wood utilization processes, reduced transportation costs, and increased power availability are factors that will contribute heavily to the development of this area within the immediate future. Subsidiary wood-processing facilities, made possible by basic forest-products plants, will complete the integration of a fully economic Manitoba forest-products industrial complex.



A timber stand in the Sipiwesk Lake district in northern Manitoba.

This lookout tower at the Cormorant Forest Reserve is one of many standing guard over Manitoba's important forest resources.

FOREST ADMINISTRATION and UTILIZATION

ADMINISTRATION

- Provincial Forest Reserves
- National Park
- Extent of commercial forests

FOREST DISTRICTS

1. Western
2. Eastern
3. Northern
4. Southern
5. Whiteshell

DISTRICT BOUNDARY — DISTRICT HEADQUARTERS

RANGER (WARDEN) STATION — LOOKOUT TOWER

UTILIZATION

PULP and PAPER MILL — SAWMILL *above 250 M.F.B.M. production 1956-57*

PULPWOOD BERTH — RAIL LINES SHIPPING PULPWOOD

LIMIT of COMMERCIAL FOREST

PULPWOOD PRODUCTION

(based on pulp shipments in cords 1957)

1000 — 5000 — 10000 — 25000 — 50000 — 100000

areas of circles are proportional to shipments

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

MINES and MINERALS

About 60 percent of Manitoba, east and north of Lake Winnipeg, is underlain by rocks of the Precambrian Era, in wihch the occurrence of rich base metal deposits has been established. The province's principal industrial minerals, as well as petroleum, are found in the southwestern third of Manitoba, where sedimentary formations underlie the prairie and park lands.

In the half century since 1907, metallic and industrial minerals valued at about $750 million have been extracted in Manitoba. Developments now underway hold promise of an accelerated growth as the northern regions are made more accessible and are subjected to intensive aerial and ground surveys.

Nickel, copper, zinc, gold, and silver, the principal metallic minerals of northern Manitoba, are recovered in four major mining areas. The International Nickel Company's Thompson development is the most recent large scale mining venture in the province.

Limestone, gravel, clay, salt and gypsum are the province's principal industrial minerals.

Metallic Minerals

Production—Nickel accounts for the greatest value among the base metals mined in Manitoba. Recovery from the Sherritt-Gordon mine at Lynn Lake is about to be supplemented by the new International Nickel operations. Sherritt-Gordon's concentrator also yields copper and cobalt.

The Hudson Bay Mining and Smelting Company, at Flin Flon, produces most of the copper and zinc in Manitoba. This company has also been a major producer of gold for many years. Its concentrator can treat 6,600 tons of complex copper-zinc-gold-silver ore per day. A new zinc-fuming plant at Flin Flon is capable of handling 150 tons of ore daily.

Production of gold is at present confined to two mining areas: (1) Rice Lake, where San Antonio Mines Limited and Forty-four Mines Limited conduct operations, and (2) Flin Flon, where the Hudson Bay Mining and Smelting Company is located. The latter operation is also responsible for most of Manitoba's silver output.

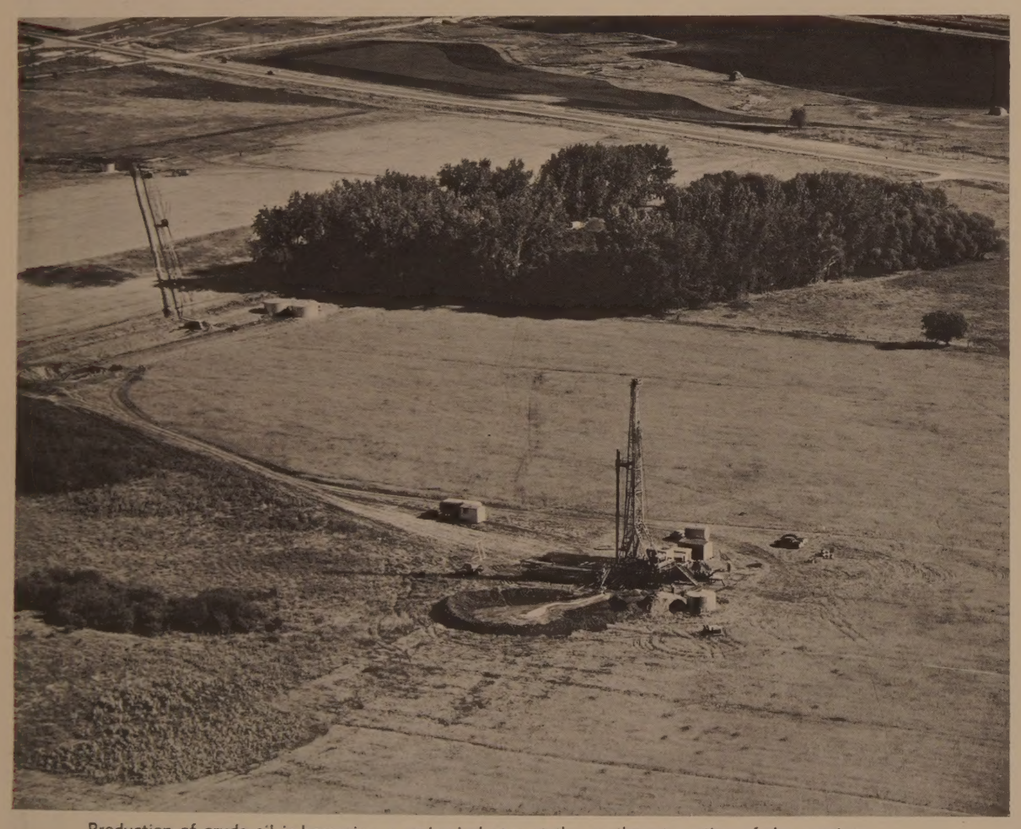
Cadmium, selenium, and tellurium are recovered as by-products from the processing of zinc and copper at Flin Flon.

Development—The huge nickel operation at Thompson is scheduled to go into operation in 1960. Underground development and surface construction at International Nickel Company's mine in the Mystery-Moak Lake area are proceeding on schedule. When completed, the mine will produce about 75 million pounds of nickel annually. This undertaking represents an investment of more than $175 million.

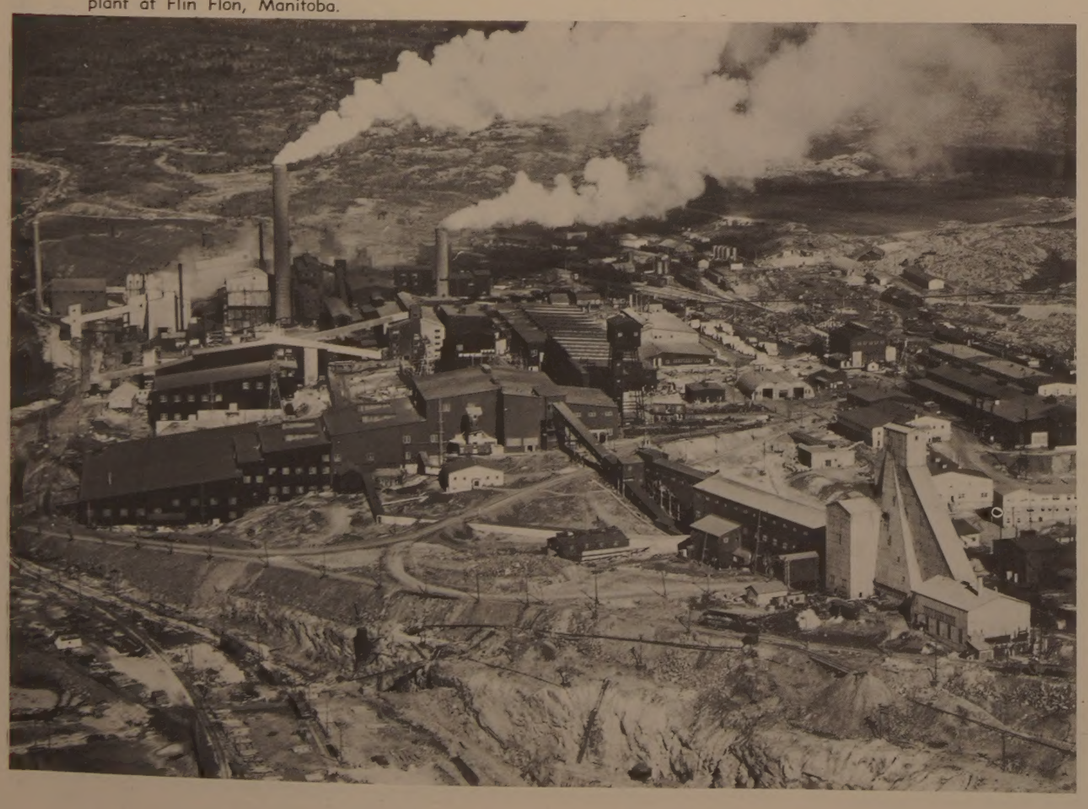
Another project underway is the Hudson Bay Mining and Smelting Company's development of a zinc deposit at Chisel Lake. Surface construction and underground lateral work are well advanced. This deposit contains over 3.5 million tons of ore, averaging 11 percent zinc, with silver, copper, gold, and lead present. This same organization is also developing a copper deposit at Stall Lake.

Exploration—In the postwar years, exploration in Manitoba reached a new peak. Most of this activity has been restricted to a metalliferous belt extending irregularly across the province between latitudes 54 and 56 degrees north (plate 3). The area most intensively prospected in recent years extends from Flin Flon eastward to Herb Lake, thence northeast, parallel to and north of the Hudson Bay Railway. Rich deposits of copper, zinc, and nickel have been located there.

Several companies are investigating lithium deposits in the southeastern part of the province. Six lithium-bearing dikes have been tested and results indicate that the largest known lithium ore body there contains 8 million tons, grading 1.8 percent lithium oxide. This lithium pegmatite at Bernic Lake also contains an estimated 150,000 ton pocket of almost pure pollucite which grades 28 percent calcium oxide. This is one of the largest known deposits of this mineral.



Production of crude oil is becoming a major industry at the southwest portion of the province.



Canada's second largest copper producer is the Hudson Bay Mining & Smelting Company plant at Flin Flon, Manitoba.

The chromite deposits in southeastern Manitoba constitute the largest reserves of this mineral in North America. Drill holes on various properties indicate that the combined ore reserves are in excess of 20 million tons, grading 4.6-26 percent chromic oxide.

Industrial Minerals

Production—Salt, the first industrial mineral to be produced in Manitoba, is still important. Clay products, gypsum, limestone, and other building materials are also extracted in large quantities.

The many brine springs issuing at the surface along the west side of Lake Winnipegosis were the basis for the first mineral industry in the province. Salt production is now confined to the Neepawa area, where it is recovered by the evaporation of subsurface brine. In addition to common salt, two other chlorides are recovered from the brine: magnesium chloride (used in the production of free-running fine salt) and calcium chloride (used to control dust on highways).

Limestone is the most abundant industrial mineral in the province and it is used in several forms. The mottled dolomitic limestone known as "Tyndall Stone" is quarried near Garson and has been used as a building stone across Canada. High calcium limestone outcroppings east of Lake Manitoba, at Steep Rock, are crushed for use in Portland cement while the deposits found at Spearhill are calcined to produce lime. Dolomitic limestone is burned at Stonewall and Inwood to form high magnesia lime.

The Canada Cement Company's fully integrated plant at Fort Whyte has a capacity of 4.5 million barrels of cement per year. The raw materials, limestone and clay, are produced by the company at Steep Rock and Fort Whyte, respectively; the gypsum and silica requirements, however, are purchased from local producers. Most of the sand and gravel used in the production of concrete aggregate is drawn from the deposits in the Birds Hill area, about 10 miles north of Winnipeg.

Extensive deposits of surface clays have been located throughout Manitoba. A major portion of the bricks used by Manitoba's construction industry is produced in Portage la Prairie. Clay is also used in the production of lightweight aggregate. Thin beds of non-swelling bentonite are found in several areas between Thornhill and Miami, in southern Manitoba. This rock is processed and sold as a finished product to the oil refining industry, where it is used as a bleaching and clarifying agent.

Outcroppings of gypsum beds are found immediately north and northeast of Gypsumville and northwest of Lake St. Martin. Exposures in this district cover a total area of 5.5 square miles. The second source of gypsum is located near the town of Amaranth, 45 miles northwest of Portage la Prairie, on the west side of Lake Manitoba. In contrast to the surface quarrying at Gypsumville, the gypsum at Amaranth is mined underground.

Exploration and Development—Exploration and development of industrial minerals have continued at a rapid pace within the province. Test drilling has indicated extensive deposits of clays and shales at Swan River, La Riviere, Learys and Arborg. Drill holes put down on the deposits at Arborg have proven that this area has an extensive deposit of kaolin and silica sand. Possibilities of using this material are being investigated at the present time.

A very rich deposit of potash has been discovered in the southwestern section of the province. The "find" appears to be very attractive; initial drilling and exploration indicate the presence of many million tons of ore. The deposit is shallower than other major bodies in western Canada.

Various other deposits of non-metallic minerals known to exist are molding sand at Brandon, Melbourne, Wye, and Ste. Rose du Lac; silica sand at Black Island on Lake Winnipeg; lignite coal at Turtle Mountain; extensive peat bogs in southeastern Manitoba and numerous sand and gravel deposits throughout the province.

Oil

Exploration for oil in Manitoba began in 1887. Although some drilling was done before the turn of the century, interest was casual until 1949, when deep drilling in the southwestern corner of the province revealed the presence of Mississippian-Age rock. This stimulated new activity and the Daly field was developed in 1951. Within seven years there were 14 declared fields in Manitoba.

At present, there are three refineries in the province: one at Brandon and two in Greater Winnipeg. These plants have a combined total capacity of 33,200 barrels per day.

The Interprovincial pipeline crosses southern Manitoba from the Saskatchewan border to Gretna, Manitoba, and continues southeast to Superior, Wisconsin and the Strait of Mackinac, thence south to Sarnia, Ontario. The Trans-Prairie pipeline runs from the oil fields in southwest Manitoba to the Interprovincial pipeline pumping station at Cromer. The possibilities of future oil discoveries in the province are far from exhausted.

MINES AND OIL WELLS

Location of mines and wells are shown on the map by number.

Site	Company	Recoverable Metals
1. Flin Flon	Hudson Bay Mining & Smelting Company	Copper, Zinc
2. Schist Lake	Hudson Bay Mining & Smelting Company	Copper, Zinc
3. Chisel Lake	Hudson Bay Mining & Smelting Company	Zinc, Copper
4. Ghost Lake	Hudson Bay Mining & Smelting Company	Zinc, Copper
5. Stall Lake	Hudson Bay Mining & Smelting Company	Copper, Zinc
6. Osborne Lake	Hudson Bay Mining & Smelting Company	Copper, Zinc
7. Crowduck Bay*	Green Bay Mining & Exploration Ltd.	
	General Lithium Mining & Chemical Corp.	Lithium
8. Lynn Lake	Sherritt Gordon Mines Ltd.	Copper, Nickel
9. Thompson	International Nickel Co. of Canada Ltd.	Nickel
10. Mystery Lake	International Nickel Co. of Canada Ltd.	Nickel
11. Moak Lake	International Nickel Co. of Canada Ltd.	Nickel
12. Greer Lake	Sudbury Exploration & Mining Limited	Berylium
13. Buck & Cor	Lithium Corporation of Canada Limited	Lithium
14. Bernic Lake	Montgary Explorations Limited	Lithium
15. Chrome Deposit	Gunnar Mines Limited	Chromium
16. Page Deposit	Manitoba Chromium Co. Limited	Chromium
17. Chance Deposit	Mashwa Nickel Chrome Mines Limited	Nickel, Copper
18. Bird Lake Deposit	Petra Chromite Limited	Chromium
19. Euclid Lake Deposit	Gunnar Mines Limited	Chromium
20. Irgon Mine	Lithium Corporation of Canada Ltd.	Lithium
21. Eagle Deposit	Lithium Corporation of Canada Ltd.	Lihium
22. New Manitoba	New Manitoba Mining & Smelting Co. Ltd.	Copper, Nickel
23. Spot Deposit	Lithium Mines & Chemicals Ltd.	Lithium
24. San Antonio Mine	San Antonio Gold Mines Limited	Gold

NON-METALLIC MINERALS

25. Gypsumville Quarry	Gypsum Lime & Alabastine Ltd.	Gypsum
26. Amaranth Mine	Western Gypsum Products Ltd.	Gypsum
27. Neepawa Salt Well	The Canadian Salt Co. Ltd.	Salt
28. Spearhill Quarry	Winnipeg Supply & Fuel Co. Ltd.	Lime
29. Inwood Quarry	Building Products & Cola Co. Ltd.	Lime
30. Stonewall Quarry	Winnipeg Supply & Fuel Co. Ltd.	Lime
31. Mafeking Quarry	Saskatchewan Cement Co. Ltd.	Lime
32. Steeprock Quarry	Canada Cement Co. Ltd.	Lime
33. Stony Mountain Quarry	City of Winnipeg	Limestone
34. Fort Whyte Pit	Canada Cement Co. Ltd.	Limestone
35. St. Boniface Pit	Atlas Light Aggregate Co. Ltd.	Clay
36. Elmwood Pit	Alsip Brick Tile & Lumber Co. Ltd.	Clay
37. Portage la Prairie Pit	Alsip Brick Tile & Lumber Co. Ltd.	Clay
38. Miami Pit	Pembina Mountain Clays Ltd.	Clay
39. Whitemouth Pit	Alsip Brick Tile & Lumber Co. Ltd.	Clay (bentonite)
40. Garson Quarries	Garson Limestone Co. Ltd.	Clay
	Gillis Quarries Ltd.	
41. Black Island Pit	Selkirk Silica Co. Ltd.	Dressed Stone
42. Beausejour Pit	Alsip Brick Tile & Lumber Co. Ltd.	Silica Sand
		Sand

OIL FIELDS

43	Routledge and West Routledge	49	Ebor
44	Virden-Roselea	50	Woodnorth
45	North Virden-Scallion	51	Tilston
46	Maples	52	Pierson
47	Daly	53	Whitewater
48	West Butler	54	Kirkella

COAL OCCURRENCES

55	Turtle Mountain	57	Pine River
56	Arborg	58	Churchill

KAOLIN DEPOSITS

56 Arborg

CLOSED MINES

A. Mandy Mine	Copper, Silver, Gold	F. Gods Lake Mine	Gold
B. North Star-Don Jon Mine	Copper, Gold, Silver	G. Jeep Mine	Gold
C. Gurney Gold Mine	Gold	H. Central Manitoba Mine	Gold
D. Sherritt-Gordon Mine	Copper, Zinc	I. Gunnar Mine	Gold
E. Nor-Acme Mine	Gold, Silver	J. Ogama-Rockland Mine	Gold

*Two separate claims within a few miles of each other.

MINES and MINERALS

METAL MINES

Producing ● Developing ● Prospective ● Closed ⚒

(Numbers beside symbols refer to mining locations—see text page)

NON-METALLIC MINERALS
(quarries, wells and pits)

Bentonite ▲ Gypsum G Limestone S Salt S Clay C Sand ◕

Producing Oil Field ▬ Potential Oil Field ● Coal Occurrences ■

Oil Pipe Line ——— Lime L Gas Pipe Line ———

VALUE OF PRODUCTION—1958 *(in 1000's of dollars)*

Metals

Non-Metals

Petroleum

16000
9000
4000
1000
250

Principal Mining Roads ———

Principal Mining Railways ———

PROCESSING PLANTS

Smelter Oil Refinery Gypsum Plants Bentonite Plant

Stone Finishing Ore Concentrator C Lime Plant L

Cement Plant Brick Plant

GEOLOGICAL DIVISIONS (ERAS)

Mesozoic Paleozoic

Cenozoic Pre-Cambrian

Approximate eastern limit of potash beds

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

COMMERCIAL FISHING

Origin and Development

Manitoba is richly endowed with lakes, rivers, and streams which cover 15.6 percent of the province. Its major lakes, especially Winnipeg, which is accessible by water from the city of Winnipeg and town of Selkirk are the main sources of the province's fishing industry, for they comprise about one-half of the water area in the province. Fish species and changes in drainage are intimately related. Various species, some traceable to the Pleistocene period, inhabit the waters. As the continental glacier melted and Lake Agassiz was created, drainage northward was blocked by the ice. Consequently, this great glacial lake flowed south into the Mississippi system, and southern fish such as the catfish, sucker, pike, and bass penetrated the area. Later, however, as the shores of Lake Agassiz receded and the direction of river flow changed, northern species such as trout and whitefish entered the region to round out the variety now found in Manitoba waters.

The Manitoba Fisheries Commission of 1910 and 1911 reported that the province's first commercial fishing venture took place in the year 1872. Icelandic settlements were located on the lake by 1875. At this early time they fished largely for their own consumption and were to become more closely identified with commercial fish in the years that followed. Still in its embryonic stage in 1888, Manitoba's fishing industry recorded a commercial catch of 4,648,250 pounds. From this meagre beginning, production has steadily increased. During the 1957-1958 seasons, 31,570,900 pounds of fish were marketed. Today, Manitoba's fresh water fisheries are the largest in western Canada and among the most important on the continent.

Species

Four main species accounted for 89 percent by commercial value, of the marketed 1957-58 catch: (1) pickerel, which abounds in Manitoba waters, accounted for the largest dollar value of any species; (2) whitefish, which is ideal as smoked fish because the oils and fats are fairly evenly distributed throughout the tissue, is second in total commercial value; (3) sauger, which is similar in appearance to pickerel, but smaller in size, ranks third in dollar value; and (4) pike, which abounds in most of Manitoba's lakes, is fourth in market value. The remainder of the 1957-58 recorded catch included tullibee, trout, suckers, perch, sturgeon, bass, goldeye, carp, bullheads, maria, and catfish. (See graph page 81).

The province's fisheries produce several products that are well known in markets throughout the continent. Manitoba's most famous fish, the goldeye, has played a decreasing role in commercial catches in recent years, though it is still very popular. Salted and processed sturgeon roe, from the 1957-58 catch, was marketed at a value of $22,000. This delicacy, known as caviar, is packaged in Winnipeg and marketed through the United States and Canada.

The only commercial salt water fishing in the province is centred at Churchill. A small white whale (beluga) is found near the mouth of the Churchill and other rivers that empty into Hudson Bay. About 10 feet long and averaging 300 pounds, the beluga is harpooned from skiffs by Indians and Metis. A processing plant at Churchill extracts the high quality oil, which is used in margarine and for the lubrication of delicate scientific instruments. The meat is frozen in blocks and sold to the fur farming industry in the vicinity of The Pas.

Methods

Fishing methods used on the major commercial lakes vary with the seasons. During the summer and fall, many men fish independently from skiffs. They tend their gillnets daily and return before nightfall. Larger boats, most of which are rented from major fish processing companies, operate with a captain and crew. The typical whitefish boat is 40 feet in length with an average catch approximating 20,000 pounds per season. On the major lakes diesel tugs haul the fish from receiving stations to processing plants.

In general, the winter season begins once the ice is safe and usually lasts until the end of March. Fishermen live in small cabins on the shore or haul their cabins onto the lake on runners. The gillnets are set under the ice surface with the help of "jiggers". Tractors and snowmobiles are used to haul the fish to rail connections. Part of the catch is hauled in heated cabooses to receiving stations, where it is packed as fresh fish. The remainder is frozen and packed at the camp sites. Most of Manitoba's fish-processing plants are located at Winnipeg, but there are some plants at Selkirk, Gimli, and outlying points. Those in the three major centres combine filleting, modern quick freezing, and attractive packaging.

The first step in bringing a top quality product to market depends on the fisherman, for it is his responsibility to make clean knife cuts and remove all entrails and blood when the fish is being dressed. At the receiving station, the operator weighs the fish, places it in layers of chipped ice, and packs it in boxes lined with waxed paper. The product is then held in cold rooms until it is transported to processing plants. Modern advances in boat, truck, and rail refrigeration have made important contributions to transportation; as a result, quality of product can be maintained in transit.

All species do not receive the same handling in the processing operation. Goldeye is smoked in Winnipeg and usually exported dressed. Large quantities of whitefish are shipped to New York dressed, where they are smoked and then marketed. Sauger, pickerel, and northern pike are generally filleted prior to marketing. The fillets are weighed, wrapped, packaged and quick frozen for approximately one hour to prevent the formation of ice crystals and resultant spoilage of tissue texture when thawing commences. This is the final marketing preparation.

Marketing

Some fish processors in the province fulfill more than one role in the industry. In some cases, depending on the species and location, they rent boats, operate receiving stations, and process and export the fish. Not all processors are exporters. Some sell their catch for export to the processors who have integrated operations or to individual exporters. Since independent receiving stations sell to the processors also, ownership may change hands a number of times.

Close supervision of processing and packaging plants has helped to promote the maintenance of high standards of quality and sanitation. The quality of fish is checked by provincial conservation officers in co-operation with the Federal Department of Fisheries. All export shipments must be checked by Federal Government Inspectors by authority of the Fish Inspection Act. New standards setting forth minimum requirements for fish-processing plants were issued by the Canadian Government Specifications Board on April 1, 1959. Voluntary observance of these standards will further improve the quality of Manitoba's produce and allow, after federal inspection, the use of a "Canada Approved" inspection stamp, which is expected to command increasing respect as a mark of assured quality.

Between 90 and 95 percent of Manitoba's commercial catch is marketed in the United States. In addition, large quantities of fresh water fish from other prairie provinces are shipped to Winnipeg to take advantage of cold storage facilities. Minneapolis, Chicago, Buffalo, Cincinnati, Detroit, and New York are the major centres receiving shipments of Canadian fresh water fish from Winnipeg. As a result, Winnipeg has become one of the largest distributing centres of fresh water fish on the North American continent.

Fisheries Management

To aid in the replenishing of desirable commercial species such as pickerel and whitefish, a number of fish hatcheries and spawn camps are operated in Manitoba. The Clear Water Spawn Camp produced 97,000,000 whitefish eggs for incubation in the Dauphin River Whitefish Hatchery in the fall of 1957. The Duck Bay and Swan Creek Pickerel Hatcheries acquire eggs from spawning pickerel moving from Lakes Winnipegosis and Manitoba into adjoining streams each spring. The young fish, in the fry stage, are released in chosen areas soon after hatching. Experimentation is important in the field and an example of this work is the planting of 50 million eyed whitefish eggs through the ice on selected grounds north of Grand Rapids along the west shore of Lake Winnipeg.

Based on the facts provided by fisheries' scientists in their constant research, a modern fisheries management program to meet the problems of conservation and development is made possible. Complexities of conservation have greatly multiplied because of the increasing demands on commercial waters. Limnological surveys assess production capabilities of given waters. Biological studies create an understanding of the influence of one species on another. The status of fish populations is determined by population dynamics, a study involving size distribution, growth and mortality rates, and daily and seasonal movement. Analyses of commercial production figures are similarly helpful in calculating abundance and/or availability. Through these methods, an optimum sustained yield is made possible.

Left—Commercial fishing is an important Manitoba industry and the province often ranks first in Canada in quantity of inland fish caught.

Right—Fishing fleet at Gimli. Lake Winnipeg yields approximately 50% of the province's commercial fish production.

COMMERCIAL FISHING

COMMERCIAL FISHING WATERS

According to seasonal use as permitted by regulation—1958

- Summer Fishing
- Winter Fishing
- Summer and Winter Fishing

FISH RECEIVING STATIONS

Figures within symbols indicate more than one fishing station

- Summer Operated
- Winter Operated
- Summer and Winter Operated
- Fishermens' Residences at Receiving Stations
- Fishermens' Residences Only

PROCESSING PLANTS

Figures within symbols indicate more than one plant

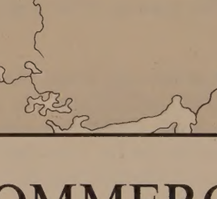
- Summer Operated
- Winter Operated
- Summer and Winter Operated

FISH CULTURE FACILITIES

- Fish Hatchery
- Spawn Camp

PRINCIPAL SPECIES CAUGHT IN MANITOBA LAKES

Letter symbols by lakes indicate (by order of importance) principal species caught



- W — Whitefish
- P — Pickerel
- K — Pike
- T — Trout
- S — Sturgeon

Beluga (Whale) Fishing

40 20 0 40 80 120

Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

GAME BIRDS and BIG GAME

Manitoba enjoys a wonderful heritage of abundant and varied wildlife. From the sharp-tailed grouse of the grassland to the barren-ground caribou of the tundra, wildlife in Manitoba represents many North American environments. The prime duck-producing areas in the southwest, the valuable and well-managed beaver, muskrat and mink populations and the large herds of deer and moose are only a few of the many wildlife features for which Manitoba is widely known.

Management of these resources is vested in the Game Branch, Department of Mines and Natural Resources. Game and fur in the north is harvested largely by Indians, who depend primarily on wildlife for their existence. Sportsmen have excellent opportunity to hunt game birds and big game on specially designated public shooting areas, on Crown lands and on private lands where permission to hunt is usually granted.

The discussion of Manitoba's wildlife is divided into the three categories: Game Birds, Big Game, and Fur-Bearing Animals. Where information is available for the species and is of general interest, the range and relative abundance of the animals are shown on the maps. Obviously, numbers and distribution of wildlife are not static: most of the maps show conditions as they were in the late 1950's. Some changes in these conditions can be expected in the future.

GAME BIRDS

The wealth and variety of bird habitat in Manitoba furnishes excellent breeding and living conditions for many waterfowl and upland game species. Most of the important kinds of waterfowl in North America abound in Manitoba during the open-water season. Upland game birds native to the prairie, forest and tundra are also common in the province.

Upland Game Birds

Eight species of upland game birds inhabit Manitoba, including two which are not native to the province. The native species are sharp-tailed grouse, pinnated grouse, ruffed grouse, spruce grouse, willow ptarmigan and rock ptarmigan. The exotic, or introduced, species are ring-necked pheasant and European, or Hungarian partridge.

Sharp-Tailed Grouse. This bird is incorrectly termed the "prairie chicken". From the sporting viewpoint, the sharp-tailed grouse is the province's most important game bird, because it occurs in greatest numbers near the settled areas, particularly in the prairie and aspen parkland portions of the province. It is most abundant where large grasslands are interspersed with agricultural areas and where young growth predominates. Burned areas regenerating to brush and second-growth aspen provide some of the most suitable sharp-tail habitats. The best areas in Manitoba are the districts between Riding Mountain and Lake Manitoba, the extreme southwest portion of the province near Melita and the southern Interlake area.

Pinnated Grouse. The true "prairie chicken", the pinnated grouse entered Manitoba from the south. In the early part of the century, it was abundant on the prairie regions. Intensive agricultural development is one of the major factors in the decline and almost complete disappearance of this species in Manitoba.

Ruffed Grouse. Commonly known as the "bush partridge", the ruffed grouse is found in varying densities throughout all of Manitoba, except for the barren grounds in the extreme northern areas and the heavily developed areas along the Red River Valley. It is most abundant in the aspen parkland and mixed forest regions of southern Manitoba, where it prefers brushy deciduous woodlands bordering meadows and cultivated lands. The Whiteshell Forest Reserve and the Duck Mountain Reserve both contain above-average numbers of this species, while the Turtle Mountain area offers some of the finest shooting in North America.

Spruce Grouse. Resembling the ruffed grouse in size and shape, the spruce grouse differs chiefly in its generally darker color and its markedly different tail pattern. It inhabits the deep coniferous forested areas of Manitoba including wet, boggy areas overgrown with spruce, larch and a thick ground cover of mosses. It inhabits the same regions as the bear and woodland caribou, that is, eastern, central and northern Manitoba. However, scattered "islands" or isolated colonies exist in the Spruce Woods Forest Reserve between Brandon and Portage la Prairie.

Rock Ptarmigan. The hardier of the two ptarmigan species, the rock ptarmigan is found solely on the tundra in the extreme northern areas. This species winters on the northern fringe of Manitoba, particularly in the vicinity of Churchill. Its summers are spent in even more northerly latitudes.

Willow Ptarmigan. This species spends its summers in Manitoba's Tundra Forest Transition Zone and its winters in the forested areas immediately to the south. Occasionally, when ptarmigan populations are high, the willow ptarmigan winters as far south as the Lake Winnipeg region and The Pas.

The two species are practically indistinguishable in the field, both sporting rusty brown-coloured wings in the spring and reverting to an almost entirely white plumage, except for black feathered tails, in the winter.

European or Hungarian Partridge. First introduced into the Province in the early 1920's, this species has fluctuated in numbers ever since. Now found generally in Manitoba's wheat-growing regions, the Hungarian partridge has become a fairly hardy species and is often observed on unsheltered prairies, where other upland game birds do not exist. These birds now inhabit the areas extending west of the Sandilands Forest Reserve to the Red River Valley. The largest number is located in the extreme southwest portion of Manitoba.

Ring-Necked Pheasant. South-central and southwest Manitoba lie on the northern fringes of the central North American pheasant range. Present populations in Manitoba, therefore, are chiefly the result of natural immigration from better pheasant ranges in the south and of the occasional release of birds raised in captivity.

The agricultural breakdown, caused by the drought in the 1930's, combined with several mild winters to create extremely favourable conditions for the pheasant. Accordingly, from 1939 to 1945. Manitoba's pheasant population reached its highest peak. Severe winters during the mid-1940's, however, combined with the resurgence of agriculture to reduce these numbers once again. Efforts to restore the pheasant population through the introduction of "pen-raised" birds have not been too successful. Because the species has not been plentiful in Manitoba in recent years, hunting of the ring-necked pheasant has not been permitted for some time.

Waterfowl

Ducks. Manitoba lies astride the Mississippi Flyway, one of the major waterfowl migration routes of the continent. The Central Flyway also, passes over western Manitoba. The province, in addition, contains some of North America's prime waterfowl breeding ranges. As a result, marshes and pot-holes in Manitoba have become world-famous as waterfowl hunting areas. Peerless sport is thus provided to approximately 35,000 resident and non-resident hunters, who bag about 300,000 ducks each year. Manitoba lists four groups of ducks: (1) Surface feeding ducks (mallard, black duck, gadwall, pintail, green-winged teal, blue-winged teal, baldpate, shoveller, and wood duck); (2) Diving ducks (redhead, ring-necked duck, canvasback, greater and lesser scaup, American goldeneye, bufflehead, and white-winged scoter); (3) Ruddy duck; (4) Mergansers (hooded, American, and red-breasted). All but the fish-eating mergansers are palatable.

The most productive waterfowl breeding area in Manitoba, in terms of the greatest numbers of ducks per square mile, is known as the Minnedosa-Erickson pot-hole district, located in the south-western portion of the province. The Lake Manitoba-Lake Winnipegosis Basin, the Saskatchewan River Delta at The Pas and the Netley Marsh at the south end of Lake Winnipeg comprise duck-breeding grounds of slightly less density.

The mallard, which accounts for more than 50 percent of all ducks bagged in Manitoba, is considered most desirable by the resident hunter. Other important species in terms of numbers bagged are the teal and lesser scaup or "bluebill". Among the diving ducks, the canvasback and the redhead are highly prized by the non-resident hunter.

The choice duck-hunting areas are located in the large marshes: the Delta Marshes at the south end of Lake Manitoba, the Netley-Libau Marshes at the south end of Lake Winnipeg and the marshes in the Saskatchewan River Delta. Other regions with good duck densities are Whitewater Lake, Oak Lake, Lake Winnipegosis and the Minnedosa-Erickson pot-hole country.

One of the most spectacular waterfowl phenomena in Manitoba occurs as tremendous flights of mallards and pintails move out to feed on grain in the stubble fields. In southeastern Manitoba wild rice provides equally good fare for lesser scaup and other kinds of diving ducks. Excellent pass and decoy shooting is afforded hunters venturing into this picturesque region.

An active waterfowl management and conservation program is carried on in the province. The efforts of the Provincial Game Branch are supplemented by the Canadian Wildlife Service, the United States Fish and Wildlife Service, Ducks Unlimited (Canada) and the Delta Waterfowl Research Station.

Geese. The species of geese occurring in Manitoba are the common Canada goose and its smaller varieties, the white-fronted goose, the blue goose and the snow goose. Occasionally the rare Ross' goose is also seen in Manitoba.

Geese in thousands visit the province in the spring during their northward migration. All but the Canada goose continue to breeding grounds in northern Canada. Significant numbers of Canada geese, however, remain in the province, nesting and raising their young in the profusion of lakes, marshes and rivers in northern Manitoba. Moreover, Canada geese bred at the Delta Waterfowl Research Station have been successfully re-introduced as breeding birds in several marsh areas in southern Manitoba.

The blue and snow geese rarely stop over in numbers on their southward migration in the autumn. The Canada goose and its smaller varieties provide the best hunting as they concentrate in many of the larger lakes and marshes across the province before moving south to their wintering grounds. The white-fronted goose migrates southward through the western part of the province but is not generally observed east of Brandon.

BIG GAME

The numerous big game animals in Manitoba serve many useful purposes. Barren-ground and woodland caribou help to sustain the native people of central and northern Manitoba but are not available in sufficient numbers to permit sport-hunting seasons. However, three species—the white-tailed or Virginia deer, the moose, and the elk—provide the sportsman with exciting big game hunting. Furthermore, the aesthetic value of big game is appreciated by all Manitoba residents, hunters and non-hunters alike.

During both summer and winter, white-tailed deer and moose range throughout the areas shown on the map. During winters of heavy snow the white-tailed deer, because of its fairly short and spindly legs, has extreme difficulty in moving about to locate food. The moose, elk, and woodland and barren-ground caribou on the other hand, seldom encounter snow of such depths that they cannot forage for food (see also plate 32).

Polar Bear

Polar bears are found only along the northeastern fringes of the province which front on Hudson Bay. They spend much of their time on the pack ice of Hudson Bay, but as the ice begins to break up in July, many of them swim ashore and are found along Manitoba's coastline during the latter part of the summer and fall. In late October and November, many of the females move inland to establish wintering dens along the coastal pressure ridges, where they give birth to their young. Mothers and cubs emerge in March and April and move out again to the ice floes.

Adult male polar bears have been known to reach total lengths of more than 9 feet and weights of more than three-quarters of a ton. Adult females are about one-quarter smaller than mature males. In the bear family, only certain members of the grizzly bear group are larger than the polar bear. One special adaptation of the polar bear is the rough pads on its feet, which assist it in moving about on slippery ice. At birth, this huge animal weighs less than 2 pounds.

Black Bear

The black bear, in both brown and black colour phases, inhabits the forested areas of the province. It is most commonly found in dense forests, especially in the Precambrian areas of north-central and eastern Manitoba. It is not found in the south-central area, where the major human population is located. Its food includes grasses, fruits, nuts, mice, birds, and insects.

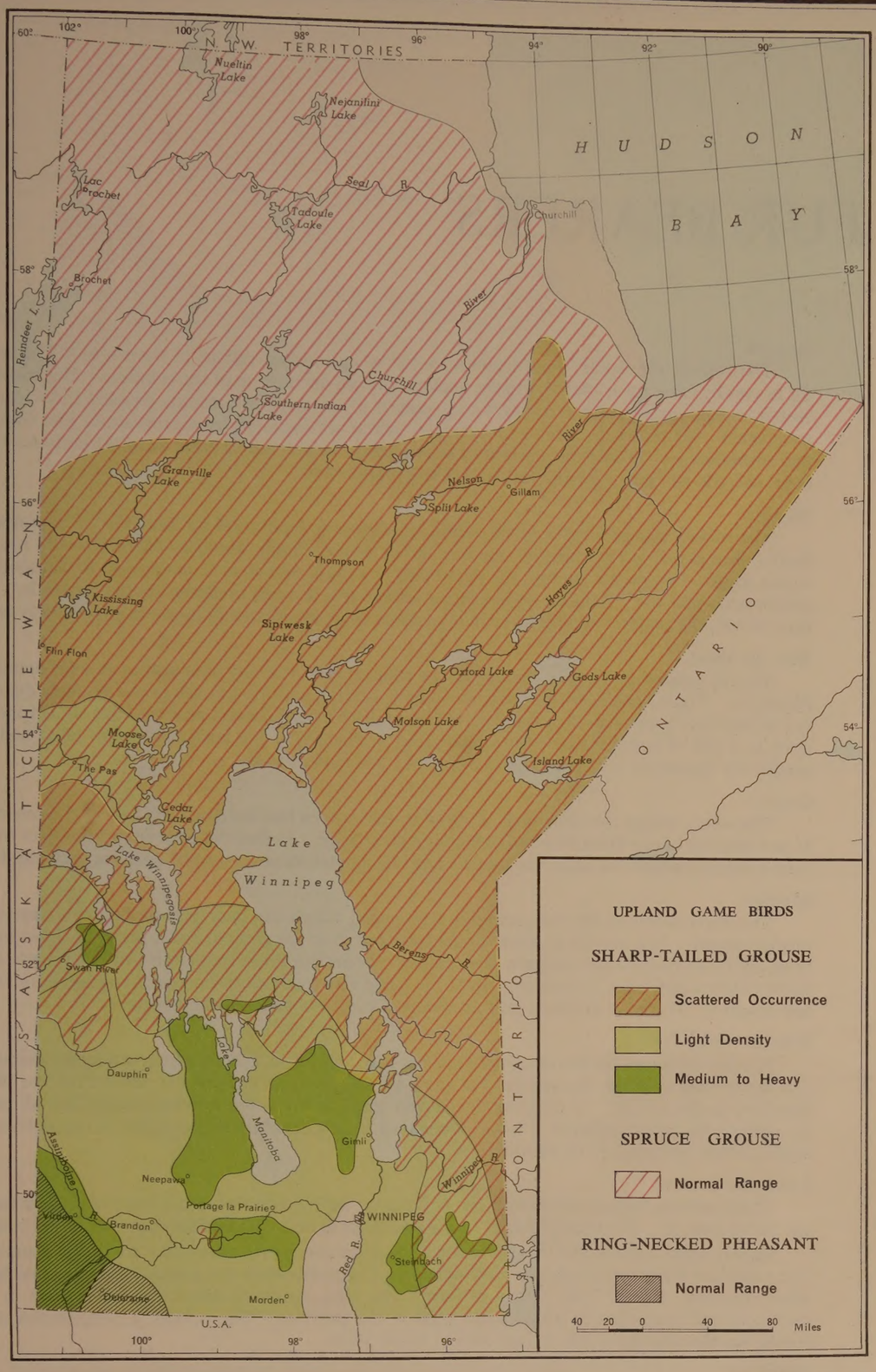
The black bear conforms to the rule that members of the bear family do not truly hibernate; they merely go into a deep sleep during the winter months. While denned up, the female bear gives birth to her cubs, generally twins weighing about one-half pound each.

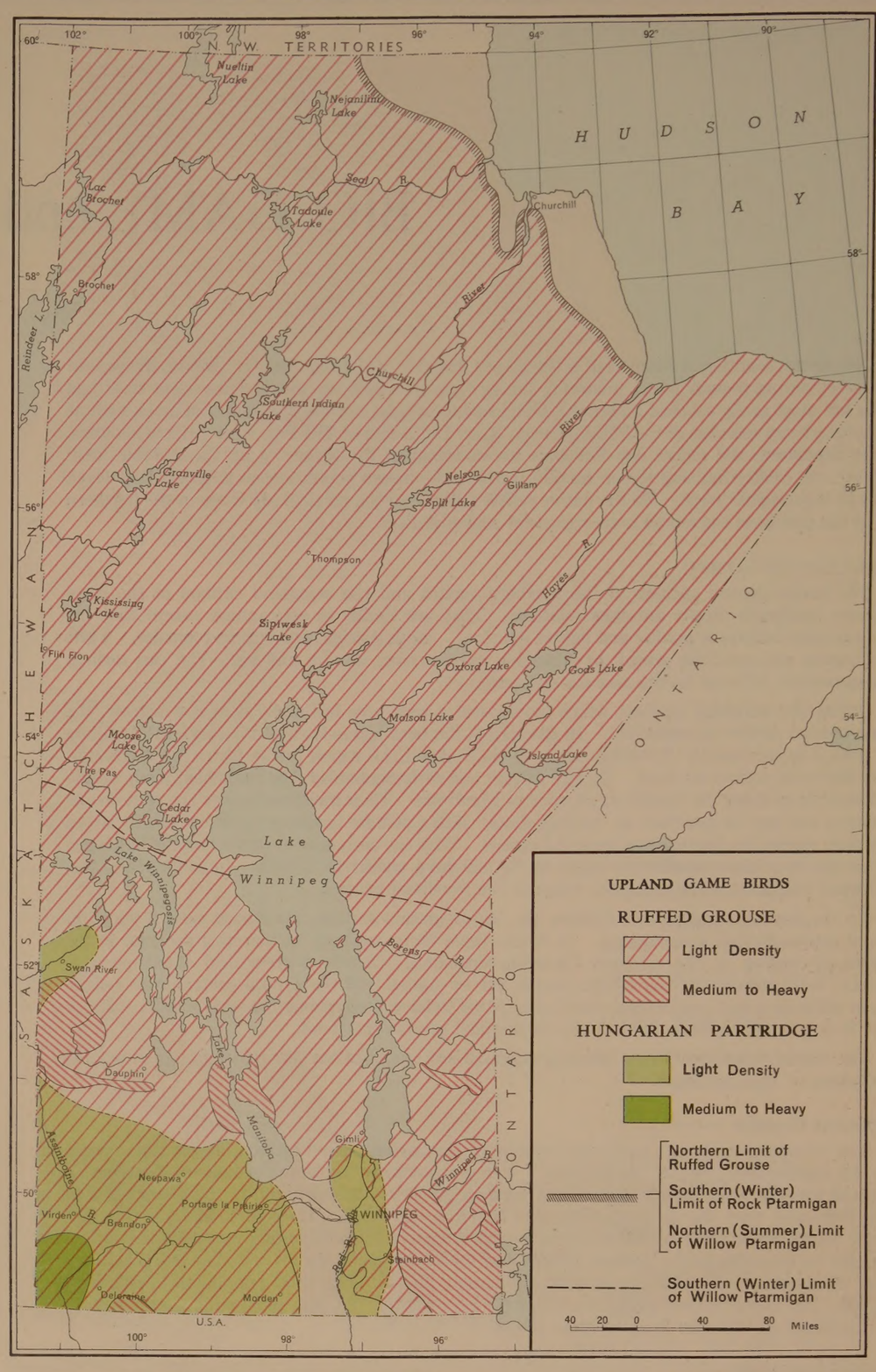
At one time, the prairie grizzly also ranged into southern Manitoba, but today only the black bear remains.

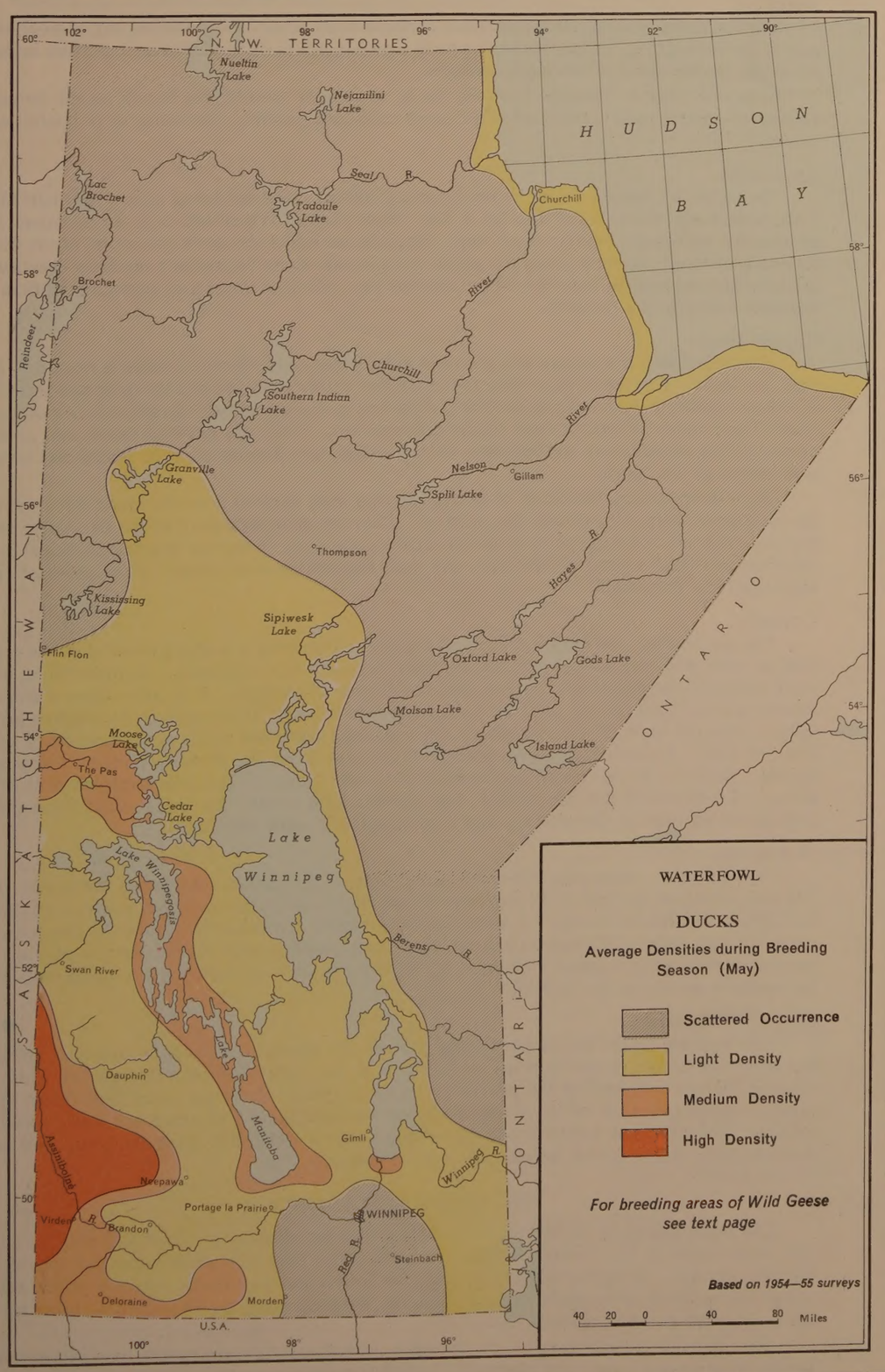
Elk

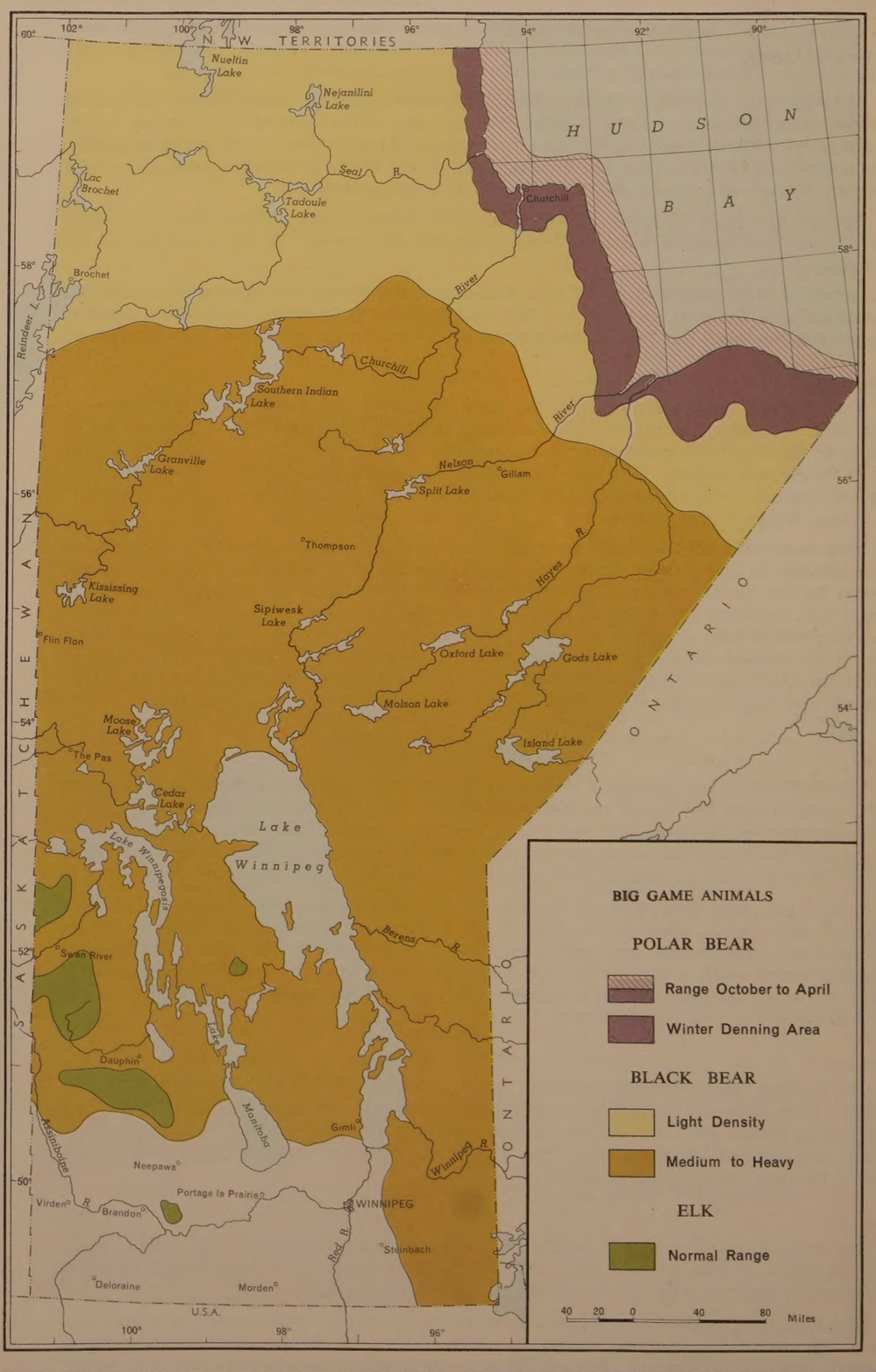
Elk originally ranged over all of Manitoba's aspen parkland and mixed forest areas. They thus inhabited much of southern Manitoba along with the buffalo and antelope, two species no longer found in the province. With the encroachment of civilization, elk were forced from the parklands into regions not so heavily populated and different from their original environment; hence, their number decreased. In recent years, protection of residual herds in some of Manitoba's forest reserves and in the Riding Mountain National Park has led to gradual increase in the elk population; a herd of 5,000 is now located in the Riding Mountain National Park. Smaller but vigorous herds are also found in the Duck and Porcupine Mountains, with remnant bands still inhabiting the Spruce Woods Forest Reserve and Interlake region.

The mature bull elk is a very majestic animal and his bugling during the rutting season in the fall is a thrill to hear. Winter is occasionally a critical period for elk in Manitoba. Their summer ranges, which are mostly in the higher reaches of Riding Mountain National Park and Duck Mountain, become heavily laden with snow. The snow cover deprives them of food, and travel through the snow becomes difficult. At these times, the animals move to lower elevations and frequently make themselves unwelcome by raiding agricultural crops and haystacks.









PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

BIG GAME and FUR BEARERS

Moose

The moose, a native of Manitoba, is the largest member of the deer family. Moose thrive best in areas of second-growth forest, following fire or logging, where the growing shoots of trees and shrubs are most easily reached as browse. Good moose populations are also found in areas such as the Summerberry marshes of the Saskatchewan River Delta east of The Pas, where willow abounds. If over-populated, the moose can influence its environment by devouring all the suitable food. However, the yearly hunting season usually restricts the moose population to a satisfactory level, except in inaccessible areas. To the native peoples of Manitoba, particularly those in the northern part of the province, the moose is an important source of food.

Barren-Ground Caribou

The barren-ground caribou of the northern tundra and the woodland caribou of the more southerly coniferous forests are close relatives. They are similar in appearance, except that the barren-ground caribou is smaller and lighter in colour. Both species have antlered females. Their large hooves are especially useful for travelling over muskeg, tundra and ice. The two caribou have somewhat different habits and dietary needs.

Unlike the woodland caribou, which moves over a wide area but really does not migrate, the barren-ground caribou is migratory. In the spring, the herd leaves its wintering area in Manitoba and travels approximately 500 miles north to the Baker Lake region in the district of Keewatin, where the young calves are born. By late August and early September, the herds have again swung southward to re-enter the tundra-forest zone of Manitoba. Their movements over the next couple of months can best be described as "milling about" with a definite tendency to retreat northward to more open tundra for the rutting season in October. With the onslaught of winter and the formation of firm ice, they move southward again to the northern coniferous forests. In some years, this southward migration will overlap the range of the woodland caribou.

To the northern Indian and Eskimo, the barren-ground caribou has always been a very important source of food and clothing. In recent years there has been an alarming decrease in the number of caribou on the northern Canadian mainland. Despite a great deal of co-operative research, valid reasons for the decline cannot yet be stated. Of the several contributory causes, human utilization and considerable waste may prove to have been among the main factors. Every effort is now being expended to halt the decline and reverse the trend.

The annual migration of the barren-ground caribou is one of the few remaining great wildlife phenomena of this continent.

Woodland Caribou

The woodland caribou, a very close relative of the barren-ground caribou, at one time ranged into the southeastern part of the province. Being exceedingly intolerant of humans, however, it retreated into the more remote central and northern areas of Manitoba and to the district east of Lake Winnipeg, once the drive of civilization began in the south. The woodland caribou is now usually found in the dense coniferous forest, where it spends much of its time searching the swamp areas for its favourite foods—mosses, lichens and the tips of small shrubs. Today, small herds of up to 75 animals roam within these vast and remote areas. Their total population is estimated at 5,000. No sport hunting season on caribou has been allowed in recent years although the natives are dependent on them for food, to some extent.

White-tailed Deer

The white-tailed deer is the most important big game animal to Manitoba hunters. In 1958, over 25,000 hunters went in search of this animal; over 16,000 were successful. In 1957, a hunter in the vicinity of Virden secured a trophy which now ranks seventh in North America.

Although little known in the days of Manitoba's early settlement, about 200,000 white-tailed deer now roam Manitoba's forests. Unlike most big game animals, the white-tailed deer thrives close to man. Settlement and the opening up of forest areas have served to create suitable habitat. After a slow increase and spread over a 50-year period, the white-tail began to show phenomenal increase. Today this species of deer inhabits most of southern Manitoba.

The summer coat of the mature white-tail is reddish brown in colour, whereas his winter coat is grey. Newly born fawns have reddish brown coats with white spots. By fall, fawns acquire the adult colour.

Antlers of white-tailed deer and of other members of this group, grow anew each summer and are shed each fall, following the rut. As a rule, only male deer grow antlers; female deer, however, occasionally grow small and poorly developed antlers because of an unbalanced hormone system.

Mule Deer

The mule deer shuns human activity and since the arrival of the white man has decreased in population. Following the growth of agriculture in southern Manitoba, this animal was forced from generally favourable southern areas into restricted regions of rougher topography and more remote from human activity. Remnant populations of mule deer are now located in the vicinity of Riding Mountain, Duck Mountain and Porcupine Mountain Forest Reserves. A few still inhabit the Spruce Woods Forest Reserve.

Mule deer and white-tailed deer are very similar in appearance, but the careful observer has little difficulty in telling them apart. Of the several differences in appearance and behaviour between the two species, the most significant are the conformation of the antlers, the method of running and the shape and colour of the tail. Mule deer antlers branch evenly, whereas white-tailed deer antlers have a main beam from which the tines curve upwards. The bounding gait of the mule deer consists of high leaps that have earned it the name of "jumping deer". This movement in the white-tailed deer is much less pronounced. The tail of the mule deer is rope-like with a white underside and black tip; that of the white-tailed deer is bushy and all white underneath.

FUR-BEARING ANIMALS

The distribution and abundance of fur-bearing animals in Manitoba depends generally upon habitat requirements and degree of human tolerance. Trapping and the higher fur values are usually associated in the public mind with the far north and remote or lonely areas. While a greater variety of fur is taken in these areas, the southern half of the province produces a surprisingly large quantity of such species as muskrat, mink, weasel or ermine, fox, coyote, and even beaver.

In total fur value, the product of the farm boy and the part-time trapper in settled or fringe settlement areas closely approximates that of the professional trapper of the North. The far northern trapper may in some years make almost his entire income from one species: the white fox. Somewhat further south, a wide variety of animals may contribute to the yearly income, but under present marketing conditions three main species—muskrat, mink and beaver, in that order—account for 70-80 percent of total trapper income.

Muskrat

The muskrat can thrive close to human beings, provided it can find a small area of suitable habitat. Thus, it may be found in any prairie slough or pot-hole, or even in roadside ditches. The ideal muskrat habitat is the large marshes of Manitoba made famous by excellent waterfowl hunting. A single muskrat pelt has much lower value than many other furs, but the total number taken makes it the most valuable single species.

Mink

The mink, a large semi-aquatic member of the weasel family, commands a high price. Many colour mutations of mink are now raised in captivity on fur ranches, but in its natural shades of dark brown to black the wild mink is still the peer of its captive cousin.

Inhabiting streams, marshes and lakes, the mink obtains much of its food from the water in the form of fish, crustaceans, frogs and insects. It is a fierce killer and the arch enemy of the muskrat, frequently claiming the muskrat's home as its own. It is well able to survive constant trapping, and record numbers have been taken in recent years.

Beaver

The beaver, the world's first engineer, is the second largest rodent in the world. The search for beaver by early fur traders led to the exploration and opening up of the country. This merciless search created such a severe shortage that only a series of closed seasons enabled it to increase once again. Its return to much of its former habitat was assisted by a program of live trapping and transplanting. Today the harvest of beaver pelts, though not so great as in the early fur trade days, exceeds all figures for the last half century and more.

Weasel

The weasel, a close relative of the mink, has the same reputation for ferocity. The ermine or short-tailed weasel is the common member of the weasel family found in Manitoba and has the widest range. A separate species, the long-tailed or prairie weasel, is common only to the southern prairie portion of the province. It is a larger animal and is much preferred by the fur trade. The least weasel, the smallest and least common of the tribe, is found mainly in the more southerly areas.

Red Squirrel

The red squirrel is the only member of the squirrel family of any significance as a fur animal in Manitoba. Found wherever trees provide a home, he makes his nest in the branches, finds quarters in a hollow tree, burrows in the ground or, in the northern fringe of forest near the edge of the tundras, nests in a pile of accumulated spruce-cone scales. The young are born naked and blind and are completely dependent on the mother for the first few weeks of life.

Otter

The otter, though not abundant, is found in the eastern and northern sections of the province. It provides one of our finest furs and demands a good price. It does not appear to be subject to the same cyclic abundance as most fur animals and the annual number trapped remains very constant.

Marten

The worst enemy of the red squirrel is the marten, which can best be described as a large tree-minded weasel. It is equally at home in the tree tops or on the ground, but it prefers to hunt in the trees, for it can outrun and outjump the squirrel. It prefers dense coniferous timber and was once quite widely distributed, but opening up of the forest and constant trapping have reduced its range and number. Today, it is found only in localized northern areas of the province.

Fisher

A larger edition of the marten, the fisher, can travel faster in the trees than any other mammal. The marten can overtake the squirrel, but the fisher can overtake the marten, and outrun the snowshoe hare on the ground. It inhabits the damper areas of forest and wooded swamps and although its numbers are greatly reduced, it is still found over wide areas of coniferous forest in the central and south-eastern portions of the province.

Lynx and Bobcat

The lynx is our largest member of the cat family. Both it and the bobcat resemble a large tabby cat with a bobtail. The lynx is slightly larger and its fur is longer and silkier than that of the bobcat.

Mainly night hunters, the lynx and bobcat are seldom seen even when they are fairly abundant. Their numbers fluctuate greatly in a rhythmic cycle of approximately ten years. The snowshoe hare, when abundant, is their main source of food. The lynx, native to Manitoba, is common in the coniferous and south-eastern mixed wood areas of the province. The bobcat, a comparative newcomer, has invaded the south-eastern area in recent years.

Red Fox

The red fox has several colour variations known as cross, silver, and black fox, any or all of which may occur in one litter. At one time silver foxes were so much in demand that an important industry developed in the raising of ranch-bred animals.

Unless he turns to domestic fowl, the fox is actually of considerable benefit to the farmer in helping to control mice, moles and other small mammals, besides consuming large quantities of insects.

Arctic Fox

The arctic fox, found only in the tundra and bordering transition forest area of northern Manitoba, is normally white, but it also has a blue colour phase. When lemmings are abundant they provide the fox's major food; in years when lemmings are scarce the arctic fox moves about widely in search of food. In some years the arctic fox abounds along Manitoba's northern coastline of Hudson Bay and may be found far out on the bay ice. At other times it disappears even from the northern border of the Province.

Timber Wolf

The timber wolf is a savage and powerful killer whose only effective enemy is man, and even man fears him. This fear is legendary and instinctive rather than justified by confirmed records of attack on humans, at least as far as the North American wolf is concerned. In spite of their savagery, wolves have many virtues in their family relationships. They are devoted mates and parents, demonstrating unusual care and tolerance of their young, and forming a strong family and hunting unit known as the "pack".

When wolves range the fringe of settlement they may turn to domestic stock for food; once having done so, they will continue this practice. They are quite capable of killing the largest of our big game animals, but they prefer a diet of smaller mammals. They are widely distributed in the timbered and tundra areas of Manitoba and from the south-eastern corner of the province range southward into Minnesota.

Coyote

The coyote has a number of other local names; in Manitoba it is also spoken of as the prairie wolf or brush wolf, depending largely on the type of country it is inhabiting. In appearance, it is a small edition of the timber wolf but less than half its size and weight. It is quite different from the timber wolf in temperament and the two species are actually antagonistic. Although a serious killer, it does not normally run in packs, is more sly than aggressive and is much more easily tamed than the wolf. It is normally carnivorous and can cause great loss to sheep breeders and poultry raisers. However, it consumes large numbers of small rodents to the considerable benefit of the farmer. Local control may be justified, but extermination is not. Its range covers the southern and central portions of the province and is gradually extending northward.

Wolverine

The wolverine, sometimes called the skunk-bear, is the largest member of the weasel tribe. The wolverine fears nothing, is the strongest animal for its size on the continent, suffers from chronic bad temper and has no friends. A wolverine on a trapline can drive the trapper to distraction by removing bait, setting off traps without getting caught, eating other animals caught in traps and spoiling or destroying trappers' supplies. Never abundant, the wolverine is now found only in the far northern portion of the province.

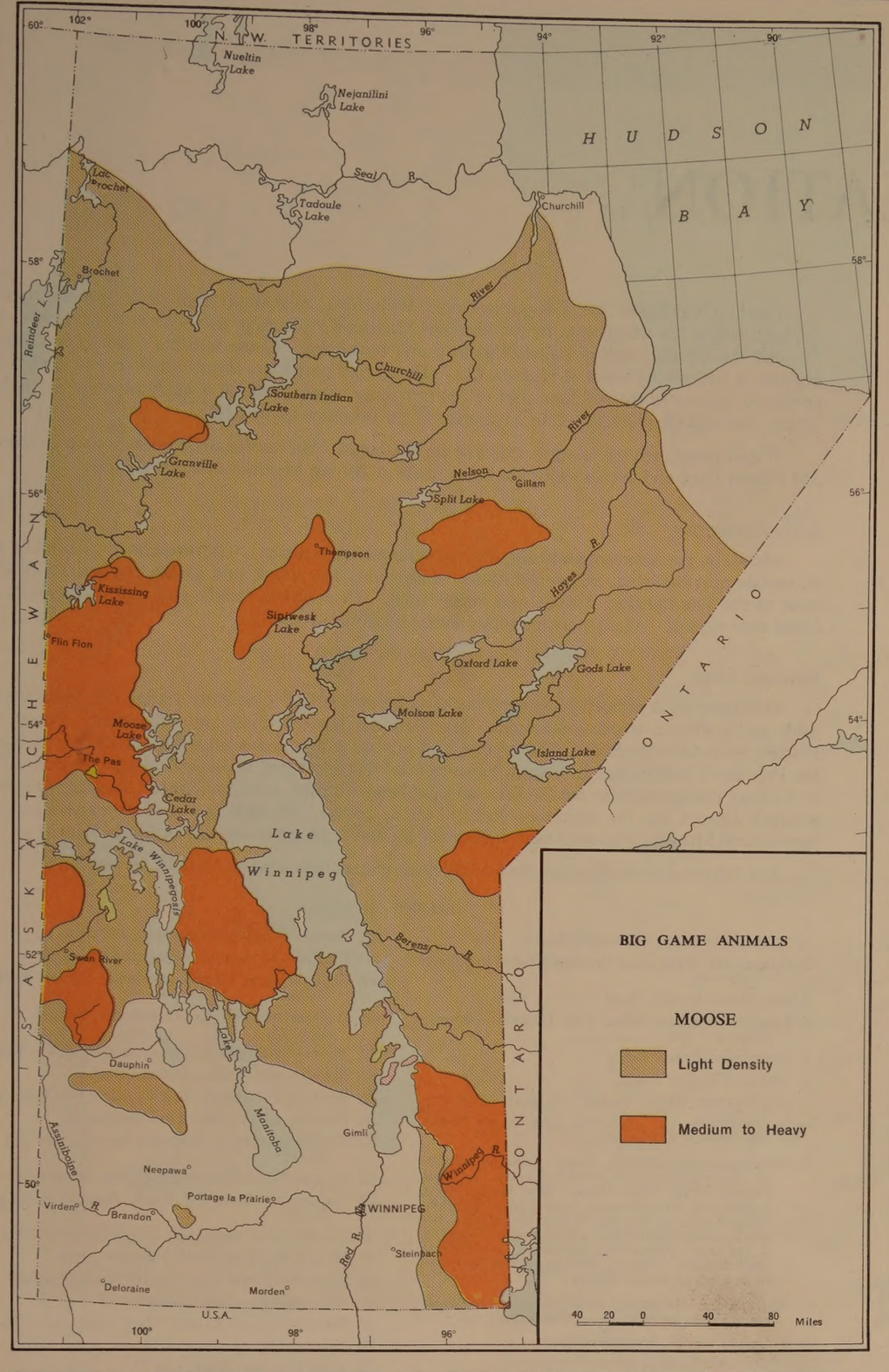
Other Fur-Bearers

Also included in the list of fur-bearing animals are the striped skunk, a charming animal if left alone; the badger, found sparingly as far north as the Duck Mountain; the raccoon, which has invaded the southern part of the province in some numbers; the white-tailed jack rabbit of the prairie and the snowshoe rabbit of the brush and woodlands, both of which are really hares, not rabbits. The only true rabbit is the cottontail, a recent immigrant from the south and easily recognizable in winter by his brown, rather than white coat.

THE RANCH FUR INDUSTRY

The ranch raising of fur-bearing animals is a thriving industry in Manitoba, with an annual production value of $3.5 million in high-class pelts. The type of animals raised has varied with popular demand. In earlier years, the fox, with its various mutations, was the prized animal; today, the industry raises mink almost exclusively, although small stocks of fox and other animals are maintained at some ranches.

Meat and fish packing plants in the province provide constant and readily available sources of foods. Rising costs of feed and operation have led to fewer ranches, but efficiency and average size have increased.



PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

RECREATION

Manitoba is well endowed with recreational resources. Large water areas, topographic variety, seasonal differences, and a colourful history provide the basis for a diversity of recreational facilities. To the natural and historical have been added man-made facilities and attractions that currently lure about 2 million people each year.

Natural Recreational Resources

Because of the geography of Manitoba, the province's natural recreational resources can be grouped roughly into several categories:

1. The Precambrian lakes and rivers of southeastern Manitoba;
2. The major lakes—Winnipeg, Manitoba, and Winnipegosis;
3. The hilly uplands of the Riding, Duck, and Porcupine Mountains;
4. The South, including the Pembina Mountain and Tiger Hills; and
5. Northern Manitoba.

The focal points of the southeastern Precambrian area are the Whiteshell Forest Reserve and the Winnipeg River. The district is rugged, with rock outcrops, an extensive forest of conifers, and many lakes and rivers. Whereas fishing was once the primary recreational activity, improved accessibility by highway and proximity to Winnipeg have made the area a popular hunting, camping, swimming, and boating site. Falcon Beach, for example, is a planned resort with a beach, motel, and golf facilities. Although the northern parts are still devoted principally to fishing, the frontier is gradually yielding to modern improvement.

Lakes Winnipeg, Manitoba, and Winnipegosis are best known for their excellent sandy beaches and duck marshes. Major summer resorts have developed on the east and west shores of lower Lake Winnipeg and on the south shore of Lake Manitoba. Lakes Manitoba and Winnipegosis offer sport fishing, while the Netley Marshes on Lake Winnipeg and the Delta Marshes on Lake Manitoba attract duck hunters.

Manitoba's three main "mountain" areas—Riding, Duck, and Porcupine—are low hills composed of end moraines, and glacial lakes; and having a heavy forest cover, they strike an interesting contrast with the adjacent plains. Only Riding Mountain, however, has been developed extensively. A National Park was established here during the 1930's. The townsite of Wasagaming is a large summer resort offering camping and trailer facilities, a good beach, boating, an excellent golf course, and cottages. A ski resort is under construction on the eastern escarpment near McCreary. Duck and Porcupine Mountains are Provincial Forest Reserves being gradually developed to satisfy the increasing demand for facilities.

In southern Manitoba, only the Red River valley is actually a flat plain which is set apart from the southwest by an escarpment. The Pembina Mountain and the Tiger Hills provide a varied landscape. The Red and Assiniboine Rivers, the major waterways of the area, are complemented by lakes such as Killarney, Pelican, and Rock, and by several artificial reservoirs constructed under the Prairie Farm Rehabilitation Act. A number of privately developed recreational areas highlighted by small artificial lakes have been constructed especially in the vicinity of Winnipeg. A ski resort is located at La Riviere, in the Pembina Mountain.

Northern Manitoba is best known for hunting and fishing. Many lodges are situated around The Pas and Flin Flon. A more remote area—famous for its record trout—is the Gods Lake-Gods River district, where several "fly-in" lodges operate. Arctic grayling, a rare and fighting game fish, is found in the more northerly rivers. Three popular annual events are the Flin Flon Trout Festival, The Pas Trappers Festival, and the Port of Churchill excursion on the Hudson Bay Railway.

Forest Reserves and Parks

A large number of Manitoba's recreational reserves and parks are provided by service organizations and the federal, provincial, and municipal governments. The major federal park is Riding Mountain National Park, in the western part of the province. Extensive recreational facilities have made it one of Canada's most popular national parks.

Manitoba maintains a series of forest reserves for conservation, and recreational facilities have been developed or provided for in many of them. The Whiteshell Reserve, in southeastern Manitoba, is the most developed of these reserves, but the facilities of the Duck Mountain, Porcupine Mountain, Turtle Mountain, North-West Angle and Cormorant Reserves are being expanded to satisfy increasing demand.

The province also maintains a number of small recreational areas varying from highway picnic areas to more extensive swimming, boating, and camping sites. As a rule, these areas cater to transients and weekend visitors.

Activities

Of the many summer activities (swimming, water skiing, sailing, canoeing, camping, golfing, tennis), fishing attracts the greatest number of tourists from other parts of Canada, and from the United States. Anglers enjoy the challenge provided by the province's game fish. The leading species and record weights for Manitoba are Northern Pike (38 lb.), Walleye (18 lb. 8 oz.), Brook Trout (8 lb. 7 oz.), Lake Trout (63 lb.), Smallmouth Bass (4 lb. 8 oz.), and Arctic Grayling (2 lb. 12 oz.).

Hunting highlights the autumn season. Waterfowl, migrating from their summer nesting grounds, follow the Mississippi flyway through Manitoba. There is excellent hunting around The Pas and the southern end of Lakes Winnipeg and Manitoba. Goose hunting from fly-in camps is popular in the remote areas of Hudson Bay. Hungarian partridge, sharp-tailed grouse, and ruffed grouse are hunted in the southern part of the province. Sport hunting of such big game animals as moose, deer and elk is carried on in most areas of the province (plate 31).

Winter resorts are still in early stages of development. Ski resorts are in operation at La Riviere and Falcon Lake and preparations are being made at Riding Mountain National Park.

Accommodations

Manitoba can accommodate the diverse demands of tourists. The Province's 275 hotels and 91 motels provide urban accommodations, while about 145 camps and lodges are located close to most of the fine hunting, fishing, and beach areas. In addition, trailer and tenting facilities are found near most of the major communities and recreational areas.

Historic Sites

Manitoba has a colourful historical background as a result of its early Indian residents, the fur trade and a diverse ethnic settlement. The National Historic Sites and Monuments Board, the Historic Sites Advisory Board of Manitoba, and private groups cooperate in increasing knowledge of the Province's history and in preserving objects of historical and archeological significance. Two of the most interesting sites are the International Peace Garden, a monument to Canadian-American goodwill located on the Manitoba-North Dakota border, 60 miles south of Brandon, and the Agricultural Museum of pioneer farm equipment at Austin, 30 miles west of Portage la Prairie.

The following table identifies the leading historic sites indicated on plate 33 by number:

HISTORIC SITES

1. Whiteshell Area—Whiteshell Mosaic
2. Gardenton—First Greek Orthodox Church in Canada —(1897-98)
3. Ste. Anne—Dawson Road
4. Emerson—Trading Posts; Fort Dufferin; Customs House and Jail
5. Letellier—Roseau Route
6. Morris—Trading Posts
7. St. Norbert—Metis "Barrier", Trappist Monastery
8. St. Boniface—La Verendrye, Grey Nun's Home, The Basilica, Riel's Grave
9. Winnipeg—Forts Douglas, Rouge, Gibralter, Garry; St. John's Cathedral; Kildonan Church; St. James Church; Seven Oaks House; Ross House; First Legislature, First Masonic Lodge; Silver Heights; Anson Northrup; The Nor'Wester; Manitoba entry into Confederation; first wheat shipment; "Countess of Dufferin"; North West Rebellion; Chief Peguis; Lord Selkirk; Thomas Simpson; John Norquay; George Bryce; Ralph Connor
10. Headingley—Dominion Lands Survey System; White Horse Plain—Indian Legend; Fort Ellice Trail
11. St. Andrews—St. Andrews Church
12. Lower Fort Garry—Indian Treaty No. 1
13. Selkirk—St. Peter's Church
14. Pine Falls—Forts Maurepas, Alexander
15. Gimili—Icelandic Settlement (1875)
16. Gretna—Mennonite Settlement (1874-80)
17. Morden—Fort Pinancewaywining; Pioneer Town of Nelson
18. Darlingford — La Verendrye's Journey to the Mandans
19. Turtle Mountain—International Peace Gardens
20. Flee Island—Indian Defence Works
21. Portage la Prairie—Fort La Reine; Fort Ellice Trail
22. Portage la Prairie—First Homestead
23. Carberry—Ernest Thompson Seton—Naturalist and Writer
24. Treesbank—Millford—Pre-railway Settlement
25. Wawanesa—Early Fur Trade; Brandon House (Fur Trade)
26. Virden—Fort Montaigne a la Bosse; Oil Discovery
27. St. Lazare—Fort Ellice; Fort Ellice Trail
28. Manitoba Narrows—Origin of Name Manitoba
29. Winnipegosis—Fort Dauphin
30. The Pas—Henry Kelsey, Henry Budd, Christ Church
31. Norway House—Norway House
32. York Factory—Fur Trade
33. Churchill—Port Churchill, Fort Prince of Wales, Samuel Hearne

Travel

As has been the experience in other parts of North America, the automobile is the most popular method of recreational travel. Over 80 percent of the tourist travel in Manitoba is now by automobile. The province's highway system provides hard-surfaced roads to all the major recreation areas, and gravel and secondary roads give access to many others.

Three highways now in the planning stage have important recreational implications for Manitoba. The Mississippi Parkway, which is a double route connecting all the parks on either side of the Mississippi River between the Gulf of Mexico and its headwaters in Minnesota, is to be extended north through southeast Manitoba. This will make Manitoba more readily accessible to United States visitors and should lead to an expansion of recreational facilities in southeastern Manitoba. Two other roads, to be constructed under the Roads to Resources Agreement, will open up vast areas between Lakes Winnipeg and Manitoba and an area north of the Winnipeg River in eastern Manitoba. A proposed addition to the former road will give access to the Gods Lake-Gods River district.

Scheduled air lines carry numerous visitors to and from the Province and between certain points within the province. Nonscheduled chartered aircraft are important connections with remote camps and recreational areas. "Fly-in" camps depend on the airplane for speedy movement of guests and supplies (plate 35).

The lakes and rivers of Manitoba, the original water highways, are still important canoe and boat routes for pleasure trips and movement of supplies. Steamship service for passengers and supplies is provided in the summer months on Lake Winnipeg between Selkirk and Norway House.

Manitoba's 39,000 square miles of lakes and rivers provide hundreds of areas naturally ideal for family vacations.

Manitoba has many well developed recreational centres including Falcon Beach in the Whiteshell Forest Reserve and famous Riding Mountain National Park pictured above.

RECREATION

TOURIST FACILITIES

- Camp Ground
- Camp Ground with Sand Beach
- Tourist Accommodation (*Numbers indicate more than one*)
- Tourist Accommodation with Sand Beach
- Tourist Accommodation, Camp Ground and Sand Beach
- Tourist Accommodation with Fishing
- Tourist Accommodation with Hunting
- Golf Course
- Ski Resort
- Rapids or Falls
- Historic Site

See names on text page

TRANSPORTATION FACILITIES

- Primary Roads
- Secondary Roads
- Northern Rail Lines
- Canoe Routes
- Steamship Route (S.S. Keenora)

FOREST RESERVES and PARKS

RECOMMENDED HUNTING and FISHING AREAS

- Upland Game
- Waterfowl
- Moose
- Sport Fishing

INSET A — THE PAS — FLIN FLON AREA

INSET B — WHITESHELL FOREST RESERVE

Scale in Miles: 40 20 0 40 80 120

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

MANUFACTURING

The manufacturing industries of Manitoba make a very substantial contribution to the economy of a region which traditionally has been described as predominantly agricultural. The *gross* value of manufactured goods produced in Manitoba regularly accounts for about 50 percent of the combined output of the province's primary and secondary industries.

This section deals with manufacturing activity in the urban centres of Manitoba, but excludes Greater Winnipeg which is discussed separately on page 78.

Growth of Manufacturing

Manufacturing in Manitoba has developed in several stages. Industrial activity got under way as an accessory to the exploitation of natural resources in the province. At first it involved the minimum of processing necessary to get bulky products to distant markets and to satisfy the immediate needs of the small rural population. The second stage began near the end of World War I, when manufacturing activity became more diversified yet remained related to the internal Manitoba market. The broadest expansion of manufacturing dates from the end of World War II. Many Manitoba firms now sell their products from coast to coast in Canada and abroad as well.

The first industries to take hold in Manitoba were lumbering and flour milling. Timber supplies were drawn from the wooded districts of eastern Manitoba. Wheat was the main agricultural crop of the province and much was ground into flour for export. Commercial mills were established early at Winnipeg, Brandon, Souris, Portage la Prairie, Neepawa, Oak Lake and other points on the railroad.

To these early manufacturing establishments new industries have been added in recent years, ranging from garment making to electrical apparatus. The long list of products shipped from Manitoba's factories is proof of the skills and the entrepreneurship which have placed the province in the forefront of Canada's industrial growth. Nearly 40 percent by value of all goods manufactured in the Prairie Provinces bear a "Made in Manitoba" label.

Factors Influencing the Growth of Manufacturing in Rural Manitoba

With the development of the provincial highway system (begun in 1925) and the more widespread ownership of private automobiles and trucks, rural residents began to travel to more distant markets, by-passing many of the smaller centres which heretofore had catered to their needs. The larger market towns benefited from the geographical expansion of their trading areas and began to attract industries that needed a central location. Thus, bakeries, creameries, locker plants, poultry processing plants, grain and feed mills sprang up in Manitoba's rural trading centres.

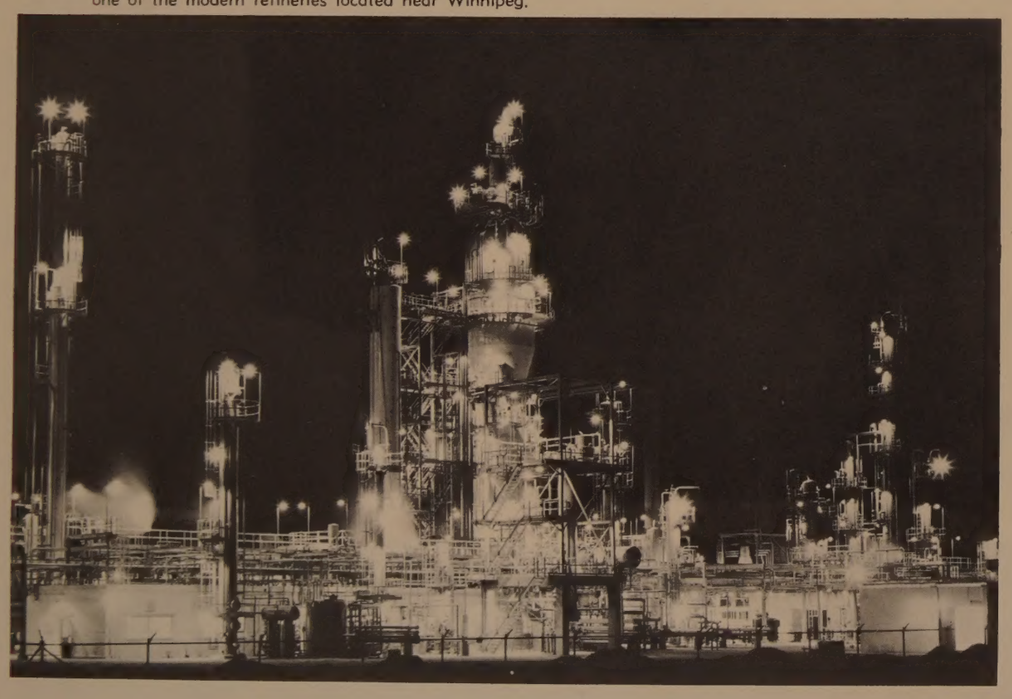
The development of hydro-electric power, which made the rural electrification program of recent years possible, has also been an important factor in attracting industry to the rural parts of the Province.

As rural centres grew, some developed specialized industries apart from those based on local production and need.

A factor that always influences the location of certain manufacturing enterprises is the proximity or the accessibility of raw materials which are either bulky or perishable, and must therefore be processed near their source. Industries in this category are the fish filleting and freezing stations at Gimli and Selkirk, the salt plant at Neepawa, the vegetable canning plants at Morden and Winkler, the canned soup plant at Portage la Prairie and the bentonite clay mining and drying operation at Morden.

Certain industries appeared in rural Manitoba in answer to war-time needs. In 1943, the Government of Canada appealed for production of vegetable oils and in 1946 a group of farmers in the Altona district organized a co-operative plant to process such oils. The plant has since been expanded and it now produces sunflower, rapeseed and flax-seed oil, meal, and as a by-product, pressed logs for fuel.

Oil refining is the third most important manufacturing industry in Manitoba. Pictured is one of the modern refineries located near Winnipeg.



In some areas the growth of a manufacturing plant has been due mainly to the foresight of aggressive civic-minded groups who recognized opportunities for benefitting their town. Typical of such an effort was the formation of a company in Boissevain to produce glued laminated wood arches and rafters. This firm imports its raw material from British Columbia and ships its products across Canada from British Columbia to Quebec and the United States. Similarly, a group of enterprising townspeople in Teulon were responsible for attracting Manitoba's first hosiery mill in 1957. The plant has since been expanded and a second mill will soon be in operation at Stonewall.

Trends in Manufacturing

In Manitoba today the majority of people employed in manufacturing are engaged in market-oriented industries producing goods mainly for the western Canadian market.

Market-oriented industries in the province fall into two groups: "consumer market-oriented" which includes clothing, food and food products, electrical appliances, printing and publishing, furniture, and "industrial market-oriented" which includes rolling stock, special farm machinery, mining and industrial machinery and heavy equipment.

Raw material oriented industries account for the balance (roughly 25 percent) of the people employed in manufacturing in Manitoba. Of the raw material oriented industries, those based on the livestock resources of the province employ the greatest number, followed by non-ferrous metals, butter and cheese, flour and feed, timber resources and fish and fur resources.

Manufacturing Centres

By comparison with Greater Winnipeg, none of Manitoba's other cities and towns can be described as major manufacturing centres. In fact, Greater Winnipeg accounts for about seven out of eight persons employed in manufacturing throughout the province.

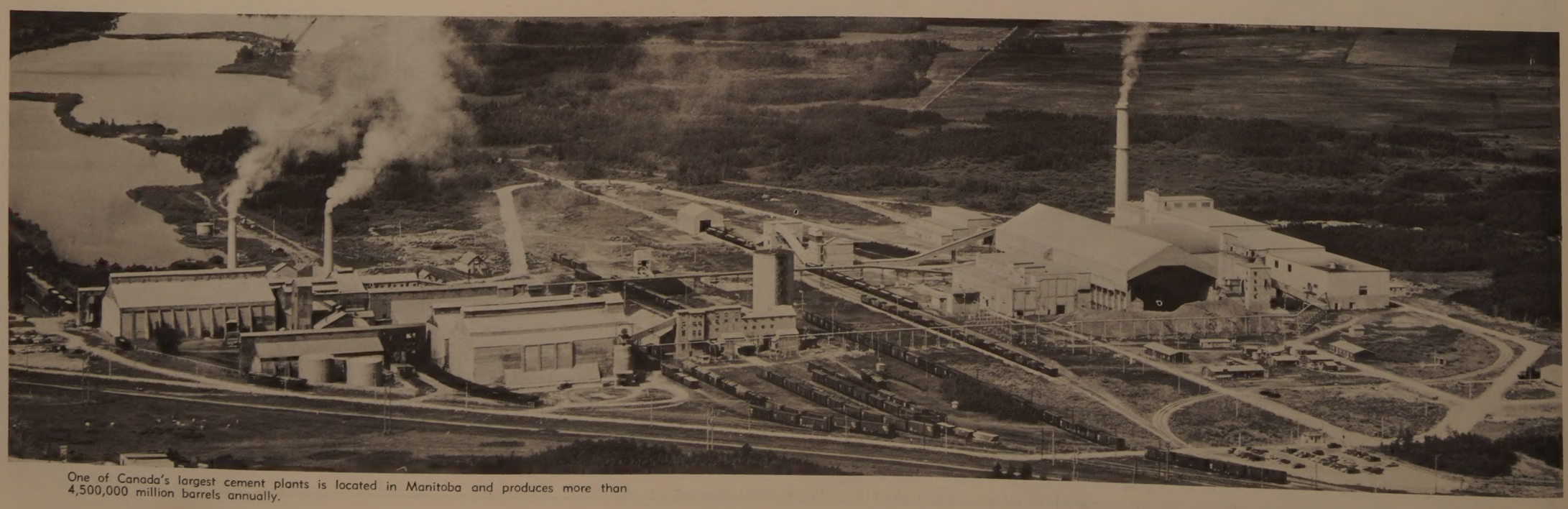
The majority of Manitoba's smaller industrial centres can be characterized as agricultural processing communities. Thus Brandon, second-largest city in the province, has become the assembly and processing point for the agricultural products of much of southwestern Manitoba. Recently oil refining and the assembly of electrical equipment have been added to the list of hitherto farm-oriented industries. Dauphin, Minnedosa, Morden, and the Mennonite-settled communities of Winkler and Altona all fit into the same category of industrial activity. Besides agriculturally based industries, Morden has a plant which dries non-swelling bentonite mined in the area before it is shipped to a plant in Winnipeg for further processing. One of Canada's major hat and cap manufacturers has recently established a branch factory in Morden. Portage la Prairie is the site of a multi-million dollar soup plant which will create a major market for garden produce. The new plant will triple industrial employment in this trading centre 50 miles west of Winnipeg.

Selkirk, 18 miles northeast of Winnipeg, and Steinbach, 38 miles southeast of the metropolis, are outstanding examples of diversification in rural Manitoba. Selkirk, which owes its fish processing and boat building industries to a location at the head of deep-water navigation on the Red River, also has the largest steel-rolling mill and the leading producer of manganese castings in western Canada. An explosives plant at East Selkirk supplies the mining industry with dynamite. A branch of a Winnipeg apparel firm adds to Selkirk's variety of industries. Steinbach, by-passed by the railroad in 1898 and barely more than a small agricultural community until World War II, owes its industrial development to the ingenuity and drive of some of its citizens. Products of local industry today include clothing shipped all over Canada; bread sold in Winnipeg and over a large area of southern Manitoba; sash, doors, and mill work with a wide market in Western Canada; concrete and metal products, and laminated wood arches and rafters.

In northern Manitoba, The Pas is the gateway to the northern mining settlements, vast timber resources, and lakes frequented by commercial and sports fishermen. Large quantities of lumber and some pulpwood are produced annually from this area and some 6 million pounds of fish are taken from northern lakes, most of it processed and shipped from The Pas. As transportation fans out from The Pas to Flin Flon, Lynn Lake, Snow Lake, Churchill, Thompson, and other northern communities yet to be established, increased manufacturing activity can be anticipated for this northern supply centre. In Flin Flon, where mining has been under way for over 30 years, operations associated with the smelter constitute the chief industrial activity.

Plate 34 shows the distribution of manufacturing by towns, and suggests comparisons of the degree of diversification achieved by some of the major centres. Compare plate 34 with plate 37.

Winnipeg is one of the leading apparel centres in Canada. Manitoba garment workers have acquired a reputation for distinctive styles and excellent workmanship.



One of Canada's largest cement plants is located in Manitoba and produces more than 4,500,000 million barrels annually.

TYPES OF MANUFACTURING

For all towns of 200 population and more - Winnipeg excepted.
Size of towns indicated by type and symbol.

GENERAL

- Lumber and Wood Products
- Paper Products
- Clothing
- Refinery
- Iron and Steel
- Printing
- Transport Equipment
- Stone, Clay, etc.
- Leather

FOOD

- Bakery Products
- Meat Products
- Dairy Products
- Poultry
- Flour and Feed
- Cold Storage
- Cannery
- Others

Circles indicate value of retail trade in millions of dollars - 1957

35 · 16 · 8 · 3 (1000's of dollars)

Figures within symbols indicate more than one plant.

20 0 20 40 60
Scale in Miles

EMPLOYMENT IN MANUFACTURING

For all towns of 1000 population and more - Winnipeg excepted. Circles indicate numbers employed (1958). Circle divisions indicate percentage of total employed in each type of production.

PRODUCTS

1. Food and Beverage
2. Petroleum, Oil Processing, Miscellaneous Chemicals
3. Wood
4. Iron and Steel
5. Paper
6. Printing and Publishing
7. Textiles and Apparel
8. Metal Smelting
9. Non Metallic Minerals
10. Electrical and Electronic
11. Grain Milling
12. Others

400 · 200 · 50 · 10 Numbers employed

Population of towns indicated by symbols
● 1000-2000 ● 2000-5000 ● over 5000

20 0 20 40 60
Scale in Miles

PROVINCE OF MANITOBA, DEPT OF INDUSTRY AND COMMERCE

TRANSPORTATION

Located in the approximate geographical centre of North America, Manitoba occupies a unique position as a marketing and distributing point. Its transportation system has played a major role in the agricultural, industrial and commercial growth of the province, and in the exploration and development of its northern region.

Highways

When the area that is now Manitoba first underwent intensive development, communication links had already been established south of the border, in the adjacent state of Minnesota. Travellers from the East usually came overland by rail or stage coach through the United States and then turned north to Winnipeg and the surrounding area. Because of its strategic position at the junction of the Red and Assiniboine rivers just south of Lake Winnipeg, the settlement at Winnipeg became the major regional population centre, from which roads and trails began to radiate. The land in the southern part of the province was flat and offered little natural obstruction to road construction. As agricultural development progressed and the railways spread out to connect settlements and carry agricultural produce to the market, feeder roads to connect with the railway lines were built. Eventually, a network of roads covered the southern part of the province.

In more recent years, as part of nation-wide highway development, Manitoba has completed its section of the Trans-Canada Highway, a hard-surfaced, modern, all-weather artery which in Manitoba extends from Ontario in the east to Saskatchewan in the west, a distance of some 300 miles. In all, the provincial highway system consists of an integrated 20,000 miles of highways, secondary roads and local roads which serve almost all of the inhabited areas. (See page 80).

The recently instituted *Roads to Resources* program will provide the province with additional highways to previously inaccessible areas. Under the joint federal-provincial program, an extensive system of new roads will be constructed in northern and eastern Manitoba. The program will concentrate on a major highway with lesser access roads. Valuable mineral deposits and timber resources will thus become available for development and utilization.

In line with the national trend in the post-war period, Manitoba's volume of freight transported by trucks is rising. The growing number of manufacturing plants and increasing wholesale and retail trade have contributed to this expansion, and an extensive network of motor-carrier services is now available throughout the province. Many communities now depend entirely or largely on trucks as the link between farms and points of consumption or processing. The traffic moved by highway transport consists largely of high-value and low-bulk commodities. Hauling rates have become generally competitive with railway freight rates for both intra- and inter-provincial movements.

An unusual feature shown on the map is a series of tractor trails reaching up into the northern areas of Manitoba. During the winter, when the muskeg is frozen and snow covers the ground, tractor trains haul supplies to settlements and communities that are virtually inaccessible by land during other seasons of the year. Large quantities of heavy, non-perishable goods, such as construction materials and fuel oil, are moved in during the winter, and stockpiled for use throughout the year.

Railways

Ever since 1870, when Manitoba entered Confederation, railways have played a vital role in the province's development. In order to facilitate further settlement, government authorities encouraged construction of railways, and Winnipeg evolved as the hub of provincial railway activity. Large land grants were given to companies willing to extend railways into new areas. By the year 1890, there were eight small railway companies operating in Manitoba, all of which were eventually absorbed by the Canadian Pacific Railway. Two other lines constructed during the succeeding fifteen years were taken over by the Canadian National Railways (plate 14).

As the map shows, the principal lines of the two transcontinental railways cross the southern part of the province and carry most of the rail passengers and much of the through-freight traffic. Both railway companies use modern diesel-powered trains for these purposes.

The importance of the secondary lines should not be underestimated, as these routes, though somewhat more circuitous than the main lines, carry a substantial volume of passengers and goods within the province and greatly facilitate internal trade and commerce.

The tertiary or feeder rail lines (plate 35) are used mainly to haul freight. Although their service is not as frequent as that of the secondary lines, the feeder lines still are important in the over-all rail transport scheme.

This ocean-going freighter is being loaded from a five million bushel capacity grain elevator at Churchill, Manitoba's seaport on Hudson Bay.

The extensive network of railways constructed over the years serves wide areas of Manitoba. Daily service is provided between Winnipeg, the rest of Canada, and points in the United States. More than 125 trains arrive at and depart from Winnipeg daily. A major link with the far northern areas of the province is provided by the Hudson Bay Branch of the Canadian National Railways, whose 500 miles of track connect The Pas and Churchill. Built and maintained with considerable difficulty over rugged terrain, this line is the major means by which grain is transported to the Port of Churchill for trans-Atlantic shipment and by which merchandise is imported from Europe. Shipments through the port, the only ocean outlet for the Prairie Provinces, have shown a substantial increase in recent years.

The combined trackage of all railways in the province totals just over 5,000 miles, excluding second main, industrial, yard track, and sidings.

Winnipeg has become one of the major railway centres of Canada. The main transcontinental lines of both the Canadian Pacific and Canadian National railways run through the city, where large staffs of employees, service facilities, and yard systems are maintained. The Winnipeg railway yards of the Canadian Pacific are among the largest privately-owned yards in the world. The Canadian National Railways maintains a staff of 4,000 employees in its Winnipeg shops to carry out most of the major service on rolling stock and locomotives in western Canada.

Air Travel

Located in St. James, on the northwestern edge of Greater Winnipeg, the well-equipped Winnipeg International Airport encompasses over 5,000 acres. Three concrete runways, each over a mile in length, handle the airport's traffic. Extensive improvements of runway and terminal facilities are being undertaken to meet the needs of the expanding air traffic.

Two transcontinental airlines use the facilities of the Winnipeg airport in their daily flights to the east and west. The Winnipeg Airport is truly "international". It is a point of departure of flights to Europe and the United States. Three intercontinental airlines have contracts with the Winnipeg International Airport for the service of their aircraft.

A scheduled regional airline provides inter-provincial service from Winnipeg to points in Ontario and Quebec, as well as extensive service to centres in northern Manitoba.

Light aircraft are used extensively in the province for such purposes as "bush" flying, crop spraying, insect control, and fish hauling. Several small companies located at various points in the province offer this type of charter service. Much of the mineral development work in Manitoba's north is facilitated by light aircraft equipped for operation on land and water in both summer and winter.

Water Travel

Manitoba's inland water travel is limited to Lake Winnipeg. The Red and Assiniboine rivers, which served as early routes of penetration and settlement, are no longer safe for large-scale navigation along most of their length.

Regularly scheduled passenger and freight services are offered during the navigation season by the S.S. Keenora, which operates from Selkirk north to Berens River, Grand Rapids, and Norway House on Lake Winnipeg.

As indicated, considerable shipping activity is carried on through the Port of Churchill from which traffic moves eastward via Hudson Bay to Europe during the navigation season.

The St. Lawrence Seaway, opened for navigation in 1959, is expected to prove an advantage, in terms of lower transportation cost, to Manitoba agriculture and industry. Ocean-going vessels are now serving the Lakehead, only 450 miles from Winnipeg, and the continued improvement of terminal facilities will assure the Seaway's maximum economic benefits to Manitoba.

Winnipeg's international airport is served by national and international airlines and provides complete aircraft engineering and maintenance facilities.

The Canadian National Railway servicing facilities at Transcona where major overhaul is made to freight and passenger cars and diesel locomotives.

TRANSPORTATION
by
ROAD RAIL AIR WATER

ROAD
- Trans-Canada Highway
- Main Provincial Highways
- Development Roads
- Winter Tractor Trails
- Projected Roads

RAIL
- Main Lines
- Secondary Lines
- Tertiary Lines

AIR
AIRLINES
Scheduled Main Line
- International
- Transcontinental
- Regional

Scheduled Secondary Line
Float and Ski Planes
- Regional

Number of Flights Weekly
(2)

AERODROMES
- Concrete or Asphalt Runway
- Gravel or Turf Runway
- Float and Ski Landing
- Float Landing
- Military Field
- Charter Air Service

Mileage from Winnipeg (50)

WATER
- Trans Atlantic Steamships
- Lake Boats (S.S. Keenora)

40 20 0 40 80 120
Scale in Miles

PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

DAYTIME POPULATION and LAND USE

METROPOLITAN WINNIPEG

Winnipeg, Canada's fourth city, is situated mid-way between Montreal and Vancouver at the eastern apex of the Prairie region. It is a gateway and funnel city for practically all the country's east-west traffic.

It became a railroad city in 1878 and today Canada's two trans-continental lines with a network of branch lines converge here. It is linked to the United States by the Great Northern Railroad and to the trans-Atlantic shipping route via the Hudson Bay Railway to the north (plate 35). It is central Canada's principal air base on the trans-continental flight for both civilian and military aircraft. While the commercial function is dominant, Winnipeg has matured to the point where the various economic, cultural and residential functions are in good balance. Its population, including municipalities, is 450,000 (est. 1960).

Most population maps of cities show the distribution of people by domicile, that is "night-time population." But a city is a functional unit teeming with people in the daytime. It is therefore only realistic to correlate its functions with the daytime population. This may be divided into four groups: (1) residential, (2) institutional, (3) gainfully employed and (4) transient (pedestrians, shoppers and motorists). The task of determining where these people are on a typical day is a formidable one, since there are no "daytime" statistics available.[1] This data is set forth by city blocks in the map of "daytime density" on the basis of the numbers per acre. At the same time the functional areas are shown as an expression of land use (plate 36).

Most of Winnipeg's daytime population is distributed according to five major functions: commercial, industrial, residential, recreational and institutional. These in turn may be further subdivided and have been mapped accordingly under 10 categories on the Land Use Areas map.

1. Commercial

The commercial function comprises the central business district (C.B.D.) or core with commercial outliers radiating from the core along principal thoroughfares. One quarter of the total population will be found in the C.B.D. with another four percent along the commercial thoroughfares radiating from it.

The C.B.D. has expanded, but not changed its essential location since the incorporation of the city in 1870. Portage Avenue and Main Street, once the junction of important trails established for trading purposes, mark the financial heart of the C.B.D. Here are many of the tallest buildings (12 and 13 stories) including the Grain Exchange, main banks and brokerage offices. Leading west from the core along Portage Avenue is the principal retail commercial section including the store and mail order house of the T. Eaton Co. Because of multiple-storied buildings serving the financial-commercial function of the city, daytime population densities reach a maximum of 500 to 5,000 persons per acre. On the edges of the C.B.D. is a fringe of varying commercial uses including automobile sales, city, federal and provincial government buildings, railroad depots and large hotels. The margin of the C.B.D. is actively extending southward to Broadway and westward to Osborne St. with new financial buildings replacing obsolete housing.

2. Light Industrial and Wholesale

The second major functional area shows a greater degree of fragmentation and scattering. Two major zones may be recognized: an older wholesale-light industrial section mostly north of the C.B.D. extending to and along the C.P.R. tracks, and a new section resulting mainly from a recent migration to the West End in the vicinity of the airport. In the older part tributary to the C.B.D., brick and stone multi-storied buildings were constructed for the rapidly expanding wholesale trade around the turn of the century. Spur lines ran from the C.P.R. tracks on the north, and Main Street was the principal commercial centre. With obsolescence, increasing traffic congestion and greater dependence on trucking, many firms have moved to the newer area in the West End. However, the garment and leather goods industries have moved in and occupied many of the former wholesale buildings finding them adaptable to their needs. Daytime densities in this area are therefore quite high ranging from 400 to 800 per acre. The West End is now the site of spacious plants with extensive ground area, ample trucking space and attractive landscaped grounds.

Winnipeg, Manitoba's capital city, is the leading commercial, financial and industrial centre of western Canada.

Densities are very light, mostly under 15 per acre. A similar area in Fort Garry Municipality is now taking shape.

Segments of light industry will be observed adjacent to the C.P.R. yards. Here are food products, cold storage plants, wholesale fruit and a miscellaneous group requiring trackage. The Point Douglas area occupying a large meander of the Red River, has a variety of both light and heavy industrial uses including flour mills, a roofing plant and lumber yards. Wherever trackage was obtainable, as in the strip adjacent to the C.N.R. yards in Fort Rouge, or across the river in St. Boniface, both light and heavy industry took root. Population densities vary considerably in this type of area depending on the kind of industry. In general densities are moderate, averaging 25 per acre.

3. Heavy Industry

This group includes industries handling bulky raw materials or finished products where rail shipping is of major importance. These are more scattered around the periphery, where two principal districts stand out: St. Boniface and the West End. These have been described on page 72. By reason of the large plant area requiring storage space and the need for mechanized equipment, densities per acre are normally light, from five to ten. Ten percent of the daytime population was found to be in light and heavy industrial areas.

4. Transportation

The focus of all rail and trucking lines and nearly all east-west flight lines, Winnipeg is both a national and international transportation centre. It is not surprising, therefore, that a total area of 6.4 square miles is occupied with railroad receiving and servicing yards in addition to 6 square miles of airport. The yards of the Canadian Pacific (largest independently owned yards in the world) are located in a broad band through north Winnipeg. Servicing facilities and repair shops for locomotives and rolling stock, together with a car building plant and foundry are maintained. These functions are duplicated in the Canadian National yards in south Winnipeg and Transcona, a detached suburb to the east of the main city. To handle highway traffic, numerous truck terminals are scattered through the urban area, especially in the West End. Numbers employed in the regional transportation industry are large in total (18,500). In the case of the C.P.R. shops the density is from 26 to 50 per acre and is even higher in Transcona. Airport population densities are approximately the same in the area of the hangars and offices.

5. Institutional

Included in this group are schools, hospitals, libraries, military and government buildings. Schools and hospitals appear as single blocks scattered at random throughout residential areas. Collectively this group accounts for 16 percent of the daytime population and densities range from 51 to 100 per acre. Greater Winnipeg has 145 public schools and 13 fully equipped hospitals. The University of Manitoba at Fort Garry, with a population of 4,000, is located on the southern fringe of the city.

The Provincial Legislative Building occupies spacious grounds on the southern edge of the C.B.D. Near at hand are other large government buildings.

Three extensive areas are occupied by military installations: the R.C.A.F. training base along the southern edge of the Winnipeg Airport; Fort Osborne Barracks, Manitoba headquarters in southwest Winnipeg; and the Carpiquet barracks in the West End.

6. Recreational

Winnipeg has 20 square miles of park area, including playgrounds. These are scattered mostly throughout the residential sections of the city. The largest park, Assiniboine, occupies a beautiful natural setting along the south bank of the river to the west of the main city. Next in size is Kildonan Park located on the north side of the city.

7. Residential

The seventh category, by far the largest both in area and daytime population, is residential. About 55 percent of the daytime population is found within it. The basis of subdividing the residential area of the city into classes was "desirability for residence." It was decided that seven criteria were involved in this definition. By weighting these criteria and applying them to city blocks, the pattern shown on the map emerged. The criteria used with their weighted indices are listed in the Appendix, page 81.

The residential pattern conforms most closely to the Burgess concentric land-use zone theory.[2] Adjacent to the city centre is a zone of obsolescent housing (Class D) which on the north side is intermixed with light industrial and wholesale uses. This is the poorer class rooming-house area with some tenement dwellings and old apartment buildings ante-dating World War I. This zone is being rapidly invaded on the south by the C.B.D. but remains fairly static on the north and west sides. Daytime population is very high, from 100 to 500 per acre. An extension of class D housing follows a wide block of land both west and east of Main Street adjacent to the C.P.R. yards. To the north of the yards is the "North End" district characterized by a considerable diversity of ethnic groups. South of the yards is an area marked for urban renewal. Similar housing flows into Point Douglas.

Next in order is the zone of "fair" desirability (class C). That part lying between Broadway and the Assiniboine River was built between 1890 and 1900 with large, expensive homes. Today these are mostly multiple dwellings. It is now being invaded by better class apartment dwellings. Its counterpart lies across the river from it. To the west of the C.B.D. is an extensive segment of older dwellings built before the First World War, now almost entirely multiple units. A very considerable area of similar housing is located in the North End. Densities are moderately high, from 25 to 50 per acre.

Peripheral to class C residential is a zone of "good" residential desirability (class B). Some are larger dwellings built just prior to the first World War as in Elmwood, Crescentwood and Norwood. Some are bungalows built in the twenties and early thirties (see map of urban growth, plate 37). Most of the larger older units have been "duplexed," but residences dating from the post-war period are mainly single dwellings. An extension of this class of housing into the more recently built-up fringes of the city (West Kildonan, East Kildonan, the West End, St. Vital and parts of Fort Garry) has occurred since the Second World War. These are mainly four- and five-roomed bungalows.

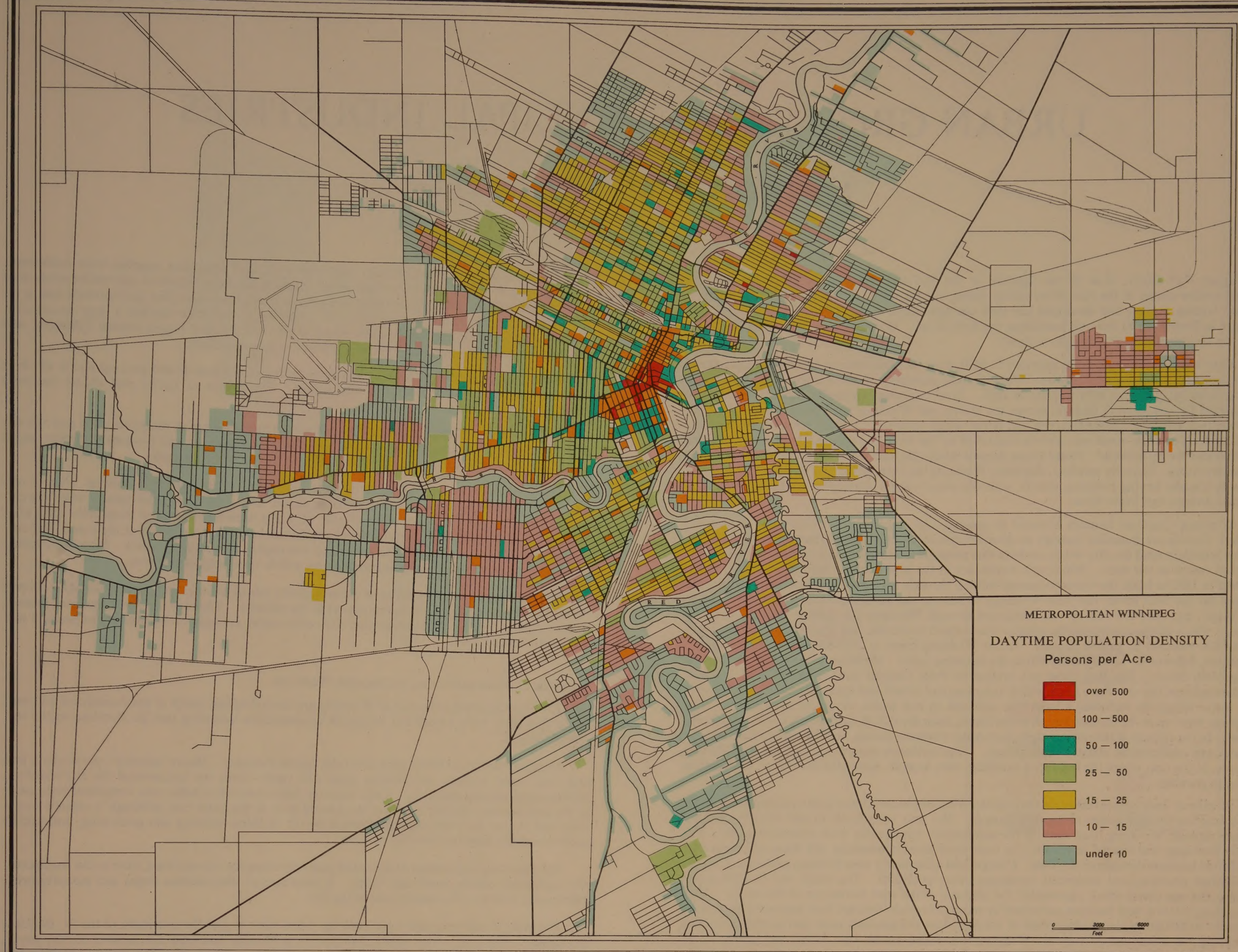
The class A district, rated the most desirable (appendix), lies in blocks mostly in the outer zone. Some areas as in "old River Heights" were built up during the late twenties and thirties; others as seen in St. James, Fort Garry, West Kildonan and "new River Heights" are mostly post-war.

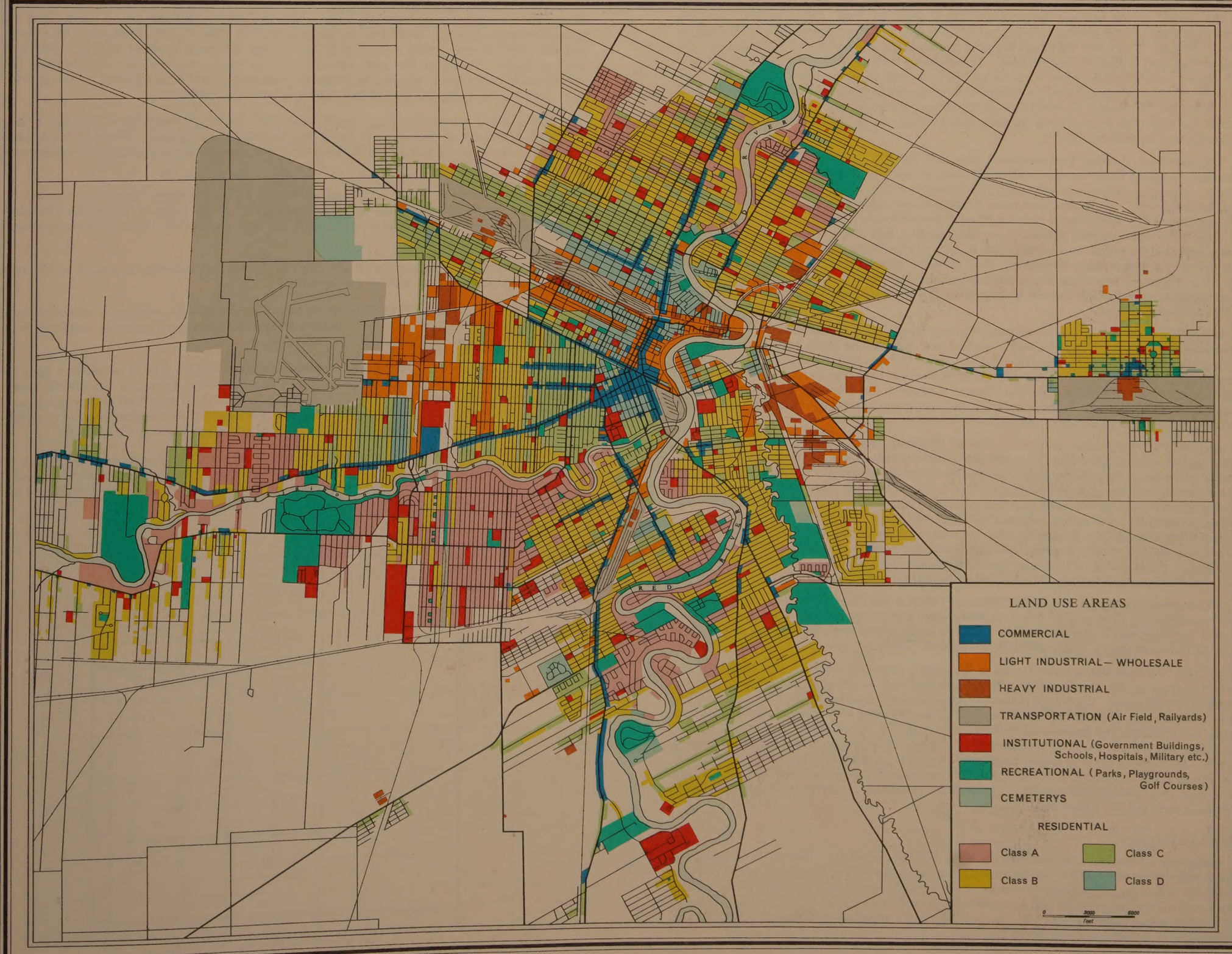
The fringes of the built-up area are expanding rapidly, especially on the west of the city where speedy transportation is afforded along Portage Avenue, and river lots are an attraction. To a lesser extent north Main Street and Pembina Highway have drawn residents to the edges of the city producing the familiar star-shaped pattern. In recent years the eastern margin, restricted by the expansion of heavy industry, has seen a rapid growth in residential use.

Transcona, a satellite city of 12,000, built in conjunction with the C.N.R. shops, is now attracting many residents who commute to Winnipeg. Of great significance to future growth is the newly completed perimeter road which will increase the tempo of communication to all parts of Metropolitan Winnipeg.

[1]The material for the maps on plate 36 was gathered for the Geographical Branch, Ottawa by the editor and a team of geographers in the summers of 1953-1955. The maps were later revised in 1959-60.

[2]Burgess, E. W. et al, **The City**, Chicago Press, 1925.





PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

URBAN GROWTH and PRINCIPAL INDUSTRIES

METROPOLITAN WINNIPEG

Upper Fort Garry, close to the junction of the Red and the Assiniboine Rivers, was the administrative centre of the Red River colony during the fur trading era. But by the late 1860's a small trading nucleus had developed less than one mile north of the Fort, where the route from Portage la Prairie joined the trail paralleling the Red River. This settlement was called Winnipeg, after the Cree word meaning "murky waters".

After Manitoba was created a province in 1870, many settlers came to occupy the agricultural lands that were opened for settlement. With this new population in the hinterland Winnipeg grew rapidly from 241 people in 1871 to 7,985 in 1881. Areal expansion on the flat Red River plain was unimpeded by any natural features except the rivers, and Winnipeg grew along Main Street, the business thoroughfare, and towards the Red River, which remained the main communications route until 1878. The basic street pattern was controlled by the river lots that had been surveyed along the Red and the Assiniboine. Notre Dame Avenue marks the junction of the lots laid out along the respective rivers. Quite by accident, therefore, Winnipeg has been favoured with one of the few city plans in Canada having radiating streets, with the major streets converging at the intersection of Portage Avenue and Main Street.

Winnipeg's regional location favoured its growth. All communication lines from eastern and western Canada are funnelled through an 80-mile corridor between Lake Winnipeg and the United States boundary, and the city which controls this passageway clearly is in a position to become the regional centre of the west. Winnipeg's dominance in the prairie region was assured when it was decided in 1881 to build the transcontinental railway through the city. Emerson and Selkirk, also located on the Red River, had been Winnipeg's rivals in the battle to become the "Gateway to the West", but once the railway was completed through Winnipeg this quickly became the centre through which all the produce of the prairies was shipped to market, and also of the wholesale trade in supplies required by prairie farmers. In the Winnipeg boom of 1881-82 there was an explosive expansion, followed by sustained growth in the following years. Buildings were pushed northwards along Main Street. The Red River was bridged at Point Douglas and the main C.P.R. line was constructed past the site where Lord Selkirk's pioneers had established their settlement. Winnipeg's first major industries, including a large flour mill and an iron works, developed in this area. New buildings went up in the district west of Main Street, from the C.P.R. tracks right to the Assiniboine River. In the vicinity of the railway there were many wholesale houses, and Winnipeg's first financial district was concentrated about Market Square. Fine residences were constructed south of Portage Avenue, in the area where the legislative buildings were located. Across the Red River, St. Boniface was also growing.

As railway lines were extended on the prairies, Winnipeg became more than a provincial capital—it became the regional centre of western Canada. Not only were goods to and from the prairies routed through Winnipeg, but most of the commercial transactions were completed there. The Grain Exchange was located in the city, as were many other commercial and financial houses that conducted business throughout the west. Colleges and a university were founded, professional people established practices, and important newspapers were published. The result was that Winnipeg became the one centre which represented the interests of the west to the rest of the nation. This integrating role is a vital function performed by regional capitals; they are focal points for leadership, dynamic coordinating places where men of varying ideas and interests meet and formulate policies promoting the welfare of the region. Winnipeg functioned for the west in this way before World War I and it grew very rapidly in those years. In the downtown area there were many changes, and the present central business district dates largely from this time. Office buildings over ten stories high were built on Portage Avenue and Main Street, and many fine stores were erected on Portage Avenue. The Grain Exchange migrated to its present site on Lombard Avenue, and the financial district re-located in the same area. The wholesale trade erected huge warehouses between Main Street and Red River, where a service railway connected the main railway lines. But there was also a tremendous expansion of the residential districts, and outlying residential areas developed: West Kildonan, St. James, Crescentwood, Fort Rouge, Elmwood and East Kildonan. In St. Boniface an important meat packing industry was growing, and to the east a new railway town, Transcona, was founded in 1912.

The spread of suburban areas continued after 1915 but this expansion was due partly to the movement of people from the older residential areas of the city to more spacious homes in the suburbs. Winnipeg's population grew relatively slowly from 1915 to 1945 because conditions were changing in the west. As Regina, Saskatoon, Edmonton and Calgary increased in size, they began to perform some of the functions for their hinterlands that had formerly been carried out in Winnipeg, and thus the western regions became more independent. Also the completion of the Panama Canal re-oriented the grain and wholesale trade of Alberta after World War I, and much of the trade generated in Alberta was lost to Vancouver. And, of course, in recent years all cities, large and small, have been affected by improvements in communications that have brought all parts of the world closer together. Head offices located in large metropolitan centres can keep a closer control on activities in outlying areas.

Since 1945 Winnipeg has been developing at a rate comparable to that of the period when it was the organizing point for building the west. Many new manufacturing plants have been established in greater Winnipeg, particularly in the suburban areas. As a result Winnipeg has continued to grow on the periphery, where many new residential subdivisions have been developed in recent years. Simultaneously central Winnipeg has also changed, notably in the older residential areas between Portage Avenue and the Assiniboine River where new apartment houses and prestige office buildings have been erected to produce a new townscape.

As a result of various forces previously outlined, Winnipeg is now a stronger metropolitan centre in an area that includes all of Manitoba, and extends into Saskatchewan in the west and to Lake Superior in the east. In some respects it is also a centre for the residents of northern North Dakota and Minnesota, even though it is in another country, because it is their nearest large city. Though the other western cities are becoming more articulate representatives of their own regions, Winnipeg still has the air of the metropolitan centre of one of Canada's major geographic regions, rather than simply a provincial capital. It controls the eastern entrance to the prairies, and has within it the Grain Exchange and various business, administrative, and research establishments that serve the entire west. It has as well, a developing mining hinterland in the Shield to the north, and it is very likely that Winnipeg will continue to be the leading centre in interior Canada.

Metropolitan Winnipeg is the leading industrial centre of the Prairie Provinces. Its more than 1,000 manufacturing firms employ almost 40,000 people, and its products are shipped to regional, national, and international markets. The value of the metropolitan area's factory shipments almost equals the combined total of the second and third cities of the prairie region.

Probably the outstanding characteristic of Winnipeg's industrial structure is its diversification. Of the 159 types of industry for which statistics are published in Canada, almost 75 percent are represented in Winnipeg. This broad industrial base is largely a result of the city's strategic position astride Canada's east-west transportation network. Thus Winnipeg has become the prime processer of bulk raw materials and agricultural commodities originating in the Prairie Provinces. By the same token, it is the key distribution centre for the products of eastern Canada destined for western markets. As Winnipeg grew up around its railroad yards and warehouses, it created its own market for consumer goods. Today it is an attractive location for industrial enterprises, because it offers a good labor pool, excellent transportation facilities and the largest concentration of people between southern Ontario and the Pacific coast.

Growth of Industry

Completion of the first transcontinental railway in 1885 opened the plains of western Canada to large-scale settlement. Winnipeg, strategically located at the railway's entrance to the prairies, became the collection and distribution centre of the western agricultural economy. The railway located repair shops, freight yards and terminal facilities at Winnipeg; thus, it became the focal point of the entire western railway network. In turn, the city's transportation growth supported the establishment of a diversity of enterprises supplying goods and services throughout the west.

Wholesale trade doubled between 1881 and 1882, and even then supplies were inadequate, particularly in clothing, implements and sleds. Some of the large industrial enterprises established at that time—a leading milling company and a major iron works—still play an important role in the city's economy. Expansion of business led to a building boom which sparked a large construction materials industry. Local lumber mills, metal works, carriage and wagon-making industries, and the garment industry—particularly work clothes—became significant.

As farming diversified, it fostered the development of stockyards and packing plants which in turn encouraged increased production and export. The output of butter and cheese increased appreciably in the 1880's.

In that decade, Winnipeg became the undisputed headquarters of the grain trade and the site of the head offices of large elevator companies. The Winnipeg Grain and Produce Exchange, which opened in 1887, subsequently became a bellwether of the world's grain trade.

The location of manufacturing in the City of Winnipeg is basically historical. Many old-established firms still occupy their original sites, chosen before the turn of the century when the city was still small. Suburban districts of greater Winnipeg were not developed intensively until after World War II. They did not have sufficient population to support industries of their own, and only the City of Winnipeg could offer the costly services required by manufacturers. Moreover, zoning regulations effectively kept manufacturing plants within their original districts.

Although more than 80 percent of manufacturing labour is still employed in Winnipeg proper, during the post-war years industry has moved to the suburbs. The need for land stimulated interest in the outlying areas, because the crowded city centre could no longer satisfy the requirements of new and expanding industry.

Location of Manufacturing in Greater Winnipeg

The manufacturing industries of Winnipeg are located mainly north of the Assiniboine and west of the Red River with a small but important concentration extending into St. Boniface on the east side of the Red.

A general pattern of three concentric belts can be discerned. Heavy industry—particularly iron and steel, metal working, and railway shops and yards—form one belt around the city's eastern, northern and western outskirts. Light industry forms two other belts: one, comprised principally of the food-products industry, follows the general path of the outer belt, although it extends southward and farther eastward; another, formed by the clothing, printing and publishing, and leather goods industries, hugs the centre of the city.

The metal-working industries are found generally along the railway lines, close to the transportation-equipment centres, yards and shops. A large aircraft maintenance depot and manufacturing plant are located near the airport west of the city.

The main slaughtering and meat-packing plants have sought the proximity of the St. Boniface stockyards. However, some meat- and poultry-processing concerns are located to the north. Slaughtering and meat packing is Manitoba's largest industry, by value of production, and greater Winnipeg is the second largest packing-house centre in Canada. Bakeries are scattered along the main distribution arteries. Several of the breweries were established close to the rivers for effluent disposal, which is now strictly controlled by the Greater Winnipeg Sanitary District's industrial waste program. Flour and feed mills depend today, as before, on proximity to railways. The pasture lands, once directly adjacent to dairies and creameries, have been absorbed by the growing city. Today, milk is shipped by truck from the farms to the processing plants.

The clothing industry is centred in the wholesale district, in the heart of the city, where, during the depression of the 1930's, it moved into unoccupied warehouses. Winnipeg is Canada's chief centre (by value) of men's work clothing; it also houses the largest individual manufacturers of women's factory clothing.

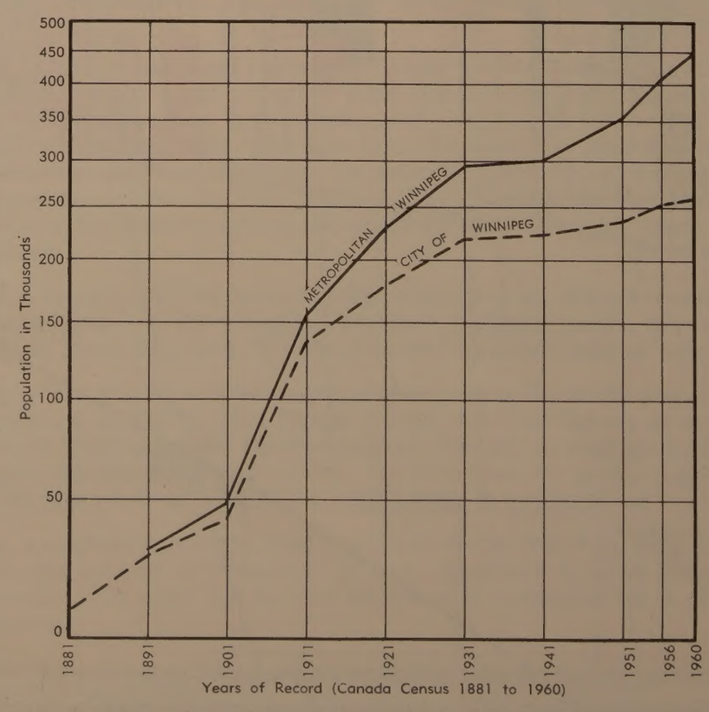
The needle trades have shown little inclination to leave downtown, which is accessible by public transport. However, because of overcrowding, and in the hopes of attracting a steadier labour supply, some firms have moved to the north and west, while others have established branches in rural areas of the province.

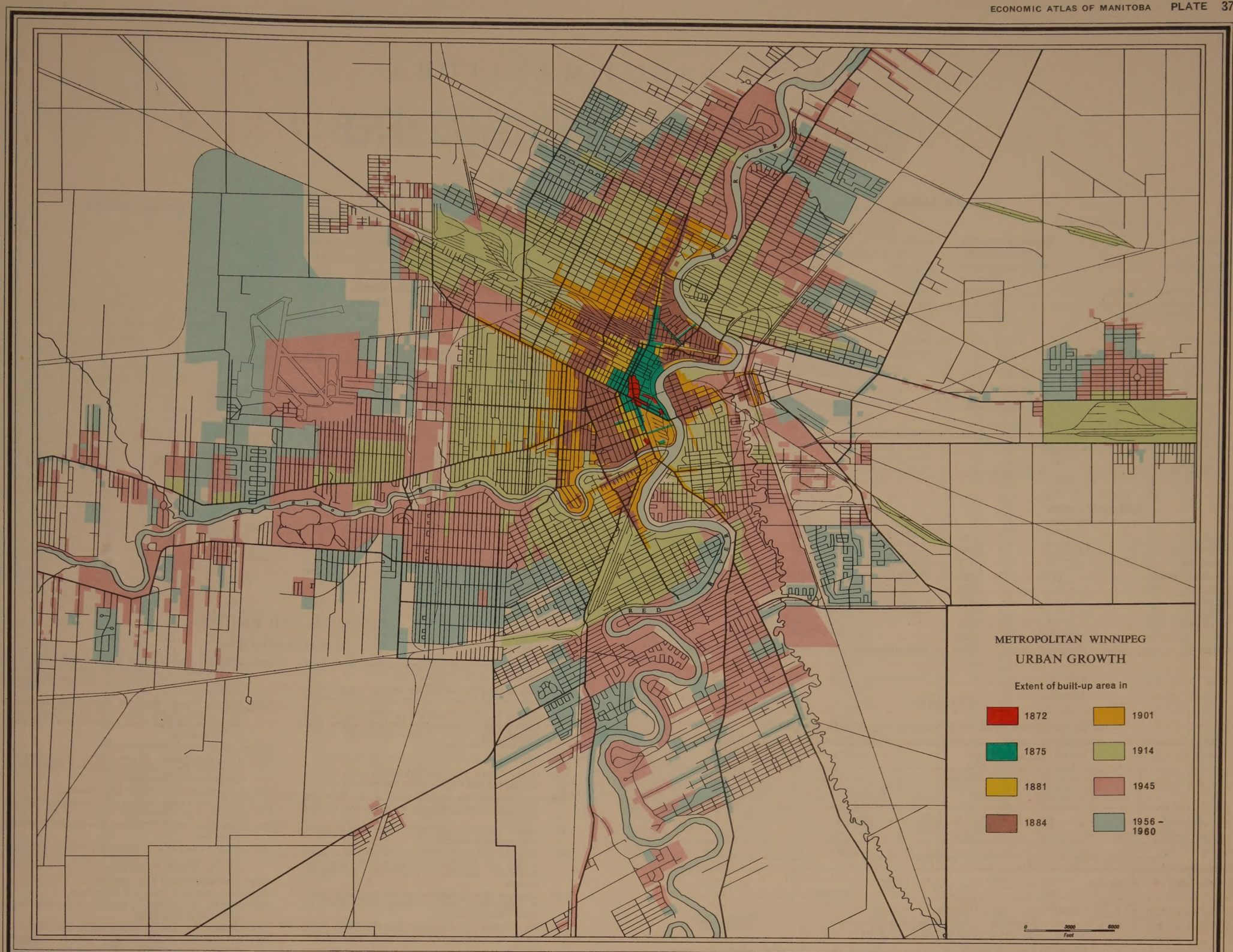
The leather products industries, closely allied to the clothing industry, is centred in the same area and is supplied by a large leather tannery nearby.

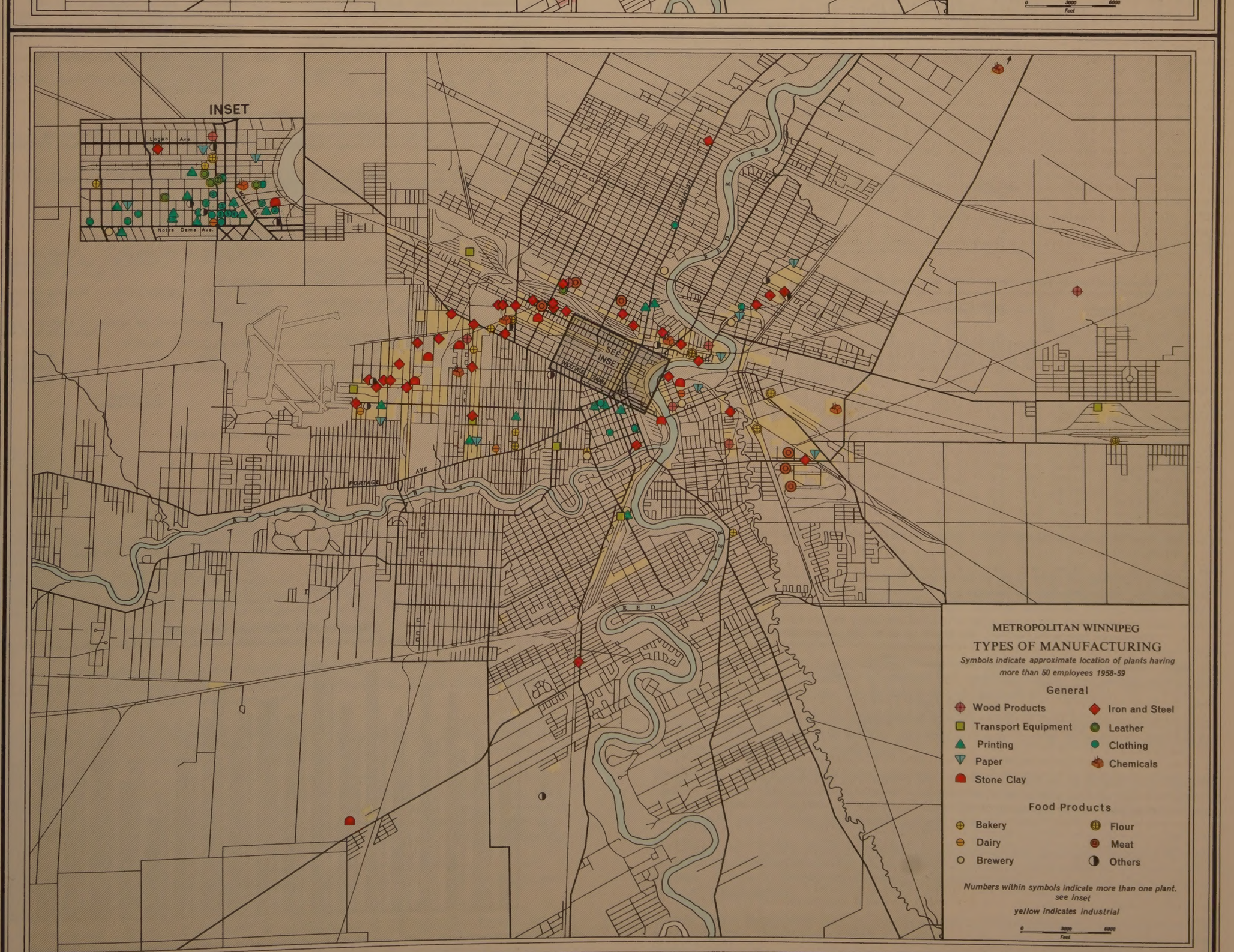
Printing and publishing is identified with the central business district, where most of its customers are located. Winnipeg has close to two hundred establishments engaged in printing and publishing, bookbinding, engraving, stereotyping and electrotyping.

Petroleum refineries, by their nature, seek sites outside the city. Two of Manitoba's three oil refineries, with a combined daily crude capacity of 30,000 barrels, operate in Greater Winnipeg: one is in East St. Paul (north); the other, in St. Boniface (east). Both draw their crude requirements from a pipeline which connects at Gretna with the interprovincial pipeline carrying western Canadian crude. They require large amounts of land and use huge quantities of water as a coolant.

The lumber and wood-products industry and the stone, clay and glass-products industries are usually located close to the railways, because of their bulk shipments. One large lumber and wood-products manufacturing concern formerly cut its own timber from berths on Lake Winnipeg and shipped the logs by water to its Winnipeg plant, on the Red River.







PROVINCE OF MANITOBA, DEPT. OF INDUSTRY AND COMMERCE

FACTS ABOUT MANITOBA

The Province of Manitoba is a land of wide diversity and rich natural resources. The principal characteristics of Manitoba are summarized on this page to provide a quick reference for commonly-sought information about the province. Additional and more detailed material will be found throughout this atlas. The data given here are based on the latest available estimates.

PHYSIOGRAPHY

DIMENSIONS

Total Area	251,000 square miles
Land	211,775 square miles
Water (fresh)	39,225 square miles
Length	761 miles
Width (southern boundary)	278 miles
Width (northern boundary)	260 miles
Width (at widest point)	493 miles

LAND AND WATER

(a)	Occupied Agricultural Land	28,018 square miles
(b)	Forest Land—Productive	55,697 square miles
	Unproductive	73,697 square miles
	Total Forested Land	129,394 square miles
(c)	Other Land—54,363 square miles. Includes urban land, road allowances, grass and bush land, and all waste land such as open muskeg, swamp and rock.	
(d)	Water— Fresh water lakes and rivers	39,225 square miles

LARGEST LAKES
(Area in Square Miles)

Winnipeg	9,398
Winnipegosis	2,086
Manitoba	1,817
Southern Indian	1,060
Island	550
Cedar	537
Moose	525
Reindeer	386
Gods	319
Cross	274

MAIN RIVERS

Rivers	Length[1]
Assiniboine	600 miles
Churchill	550 miles
Nelson	410 miles
Seal	375 miles
Hayes	320 miles
Saskatchewan	190 miles
Red	140 miles
Souris	130 miles
Winnipeg	110 miles

[1]Figure gives length of river contained in Manitoba only, not total length of river.

HIGHEST ELEVATIONS
(Elevation above Sea Level in feet)

Mount Baldy	2,727
Hart Mountain	2,700
Turtle Mountain	2,500
Riding Mountain	2,410

PROVINCIAL PARKS

Duck Mountain Forest Reserve	1,426 square miles
Whiteshell Forest Reserve	1,088 square miles
Porcupine Forest Reserve	787 square miles
Cormorant Forest Reserve	575 square miles
Sandilands Forest Reserve	570 square miles
Northwest Angle Forest Reserve	280 square miles
Agassiz Forest Reserve	275 square miles
Spruce Woods Forest Reserve	222 square miles
Turtle Mountain Forest Reserve	109 square miles
Belair Forest Reserve	53 square miles

NATIONAL PARKS

Riding Mountain	1,148 square miles

CLIMATE

MEAN DAILY MAXIMA AND MINIMA—EXTREME VALUES

City	January				July			
	Maximum		Minimum		Maximum		Minimum	
	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
Winnipeg (1915-50)	+21 (1942)	−8 (1950)	+4 (1944)	−24 (1950)	89 (1936)	74 (1915)	62 (1935)	53 (1942)

Climatological Table for Winnipeg (City) (Man.). Lat. 49° 53′N. Long. 97° 17′W. Altitude above MSL 786 ft.

Month	Pressure: Mean at M.S.L.	Air Temperature at Station Level: Daily Mean	Mean of daily: Max.	Mean of daily: Min.	Mean of monthly: Max.	Mean of monthly: Min.	Absolute extremes: Highest recorded	Absolute extremes: Lowest recorded	Relative Humidity: 1230 C.S.T.	Precipitation: Mean Total all forms	Precipitation: Max. fall in 24 hours	Precipitation: Mean Snowfall (in. of snow)	Number of days of: Rain, ≥ .01 in.	Number of days of: Snow, depth ≥ 1 in.	Number of days of: Frost (in screen)	Number of days of: Fog (vis. ≤ 1 km.)	Number of days of: Gale ≥ 39 m.p.h.	Number of days of: Thunder	Percentage of Time with: Clear sky (≤ 3/10 covered)	Percentage of Time with: Overcast sky (≥ 9/10 covered)	Cloud amount, tenths of sky covered: Mean for 24 hours	Cloud amount, tenths of sky covered: 0030 C.S.T.	Cloud amount, tenths of sky covered: 0630 C.S.T.	Cloud amount, tenths of sky covered: 1230 C.S.T.	Cloud amount, tenths of sky covered: 1830 C.S.T.	Wind Directions: Percentage frequencies means of 24 hourly observations daily: N	NE	E	SE	S	SW	W	NW	Calm
	mb.	°F	°F	°F	°F	°F	°F	°F	%	in.	in.	in.																						
Jan.	1021	−3	7	−13	31	−37	46	−48	84	0·9	0·75	9	<1	12	31	2	0	0	35	54	6	5·6	5·4	6·5	6·1	12	4	4	12	17	12	14	23	2
Feb.	1021	2	12	−9	36	−33	47	−47	86	0·8	0·57	8	<1	10	28	3	<1	0	38	50	6	5·1	5·3	6·1	6·0	13	6	4	13	13	13	12	33	3
Mar.	1020	16	27	4	46	−21	74	−38	78	1·1	1·18	10	1	8	29	2	<1	<1	33	56	6	5·2	6·0	6·0	6·7	16	9	5	15	10	9	11	24	1
Apr.	1018	38	48	27	71	6	90	−18	60	1·3	0·88	4	6	3	20	1	<1	1	31	52	6	5·0	6·3	6·6	6·3	17	13	8	18	10	8	7	18	1
May	1015	52	65	40	84	23	100	11	51	2·2	1·44	1	10	1	8	1	0	2	29	54	6	4·8	6·3	7·2	6·6	18	15	9	18	9	18	6	17	<1
June	1013	62	74	50	89	35	101	21	55	3·1	1·78	<1	12	0	1	1	<1	5	25	56	6	5·3	6·7	7·3	6·7	13	12	8	17	12	11	10	17	<1
July	1013	67	79	55	91	43	108	35	57	3·0	2·72	0	10	0	0	1	0	6	35	40	5	4·0	5·3	6·0	5·4	12	9	6	18	13	10	12	19	1
Aug.	1014	64	76	52	91	38	103	30	56	2·4	2·57	0	10	0	0	1	0	6	37	42	5	3·8	4·8	6·4	5·5	11	8	8	18	14	12	12	17	<1
Sep.	1015	54	65	43	84	27	99	17	59	2·3	2·56	<1	9	<1	4	2	<1	2	32	49	6	4·5	6·2	6·7	6·1	11	7	8	18	12	12	13	19	<1
Oct.	1015	41	51	31	72	15	86	−5	62	1·4	2·93	3	5	2	14	2	<1	1	37	48	6	4·5	5·5	6·3	5·9	12	7	5	17	14	11	11	22	1
Nov.	1019	22	30	14	51	−12	71	−34	80	1·1	0·67	9	3	7	28	3	0	0	21	70	7	7·0	7·2	8·0	7·5	12	8	5	13	13	13	12	23	1
Dec.	1019	6	15	−3	37	−29	53	−54	85	0·9	0·85	9	1	10	31	3	<1	0	32	57	6	5·7	5·7	6·9	6·5	11	7	3	14	16	13	12	22	2
Mean	1017	35	46	24					68										32	52	6	5·0	5·9	6·7	6·3	13	9	6	16	13	11	11	20	1
Extreme or total							108	−54		20·5	2·72	54	68	53	194	22	3	23																
Number of years' observations	64	←	77	→	← 65 →		← 55 →		11	77	11	77	←						10							←				13				→

Climatological Table for Brandon (Man.). Lat. 49° 51′N. Long. 99° 57′W. Altitude above MSL 1,200 ft.

Month	Pressure: Mean at M.S.L.	Air Temperature at Station Level: Daily Mean	Mean of daily: Max.	Mean of daily: Min.	Mean of monthly: Max.	Mean of monthly: Min.	Absolute extremes: Highest recorded	Absolute extremes: Lowest recorded	Relative Humidity: 1230 C.S.T.	Precipitation: Mean Total all forms	Precipitation: Max. fall in 24 hours	Precipitation: Mean Snowfall (in. of snow)	Number of days of: Rain, ≥ .01 in.	Number of days of: Snow, depth ≥ 1 in.	Number of days of: Frost (in screen)	Number of days of: Fog (vis. ≤ 1 km.)	Number of days of: Gale ≥ 39 m.p.h.	Number of days of: Thunder	Percentage of Time with: Clear sky (≤ 3/10 covered)	Percentage of Time with: Overcast sky (≥ 9/10 covered)	Cloud amount, tenths of sky covered: Mean for 24 hours	Cloud amount, tenths of sky covered: 0030 C.S.T.	Cloud amount, tenths of sky covered: 0630 C.S.T.	Cloud amount, tenths of sky covered: 1230 C.S.T.	Cloud amount, tenths of sky covered: 1830 C.S.T.	Wind Directions: Percentage frequencies means of 24 hourly observations daily: N	NE	E	SE	S	SW	W	NW	Calm
	mb.	°F	°F	°F	°F	°F	°F	°F	%	in.	in.	in.																						
Jan.	1020	−3	8	−13			44	−50		0·7		7				6		0	38	49	5	4·4	4·7	6·7	6·0									
Feb.	1021	1	12	−10			49	−52		0·5		6				6		0	33	50	6	4·9	5·4	6·4	6·3									
Mar.	1019	6	28	5			78	−42		0·7		7				4		0	28	56	6	5·4	6·1	7·2	6·7									
Apr.	1016	38	50	26			88	−16		0·9		4				4		0	28	51	6	5·1	5·9	6·8	6·2									
May	1014	51	65	38			99	7		1·6		1				2		2	23	56	7	5·1	6·5	7·5	7·1									
June	1012	60	73	48			106	26		2·7		<1				5		5	21	57	7	5·6	7·1	7·3	7·0									
July	1013	65	79	52			110	32		2·3		0				3		8	34	34	6	4·1	5·3	5·9	5·5									
Aug.	1014	62	76	49			106	26		2·1		0				2		6	31	40	5	3·7	5·3	6·4	5·7									
Sep.	1014	53	66	40			100	11		1·5		<1				5		1	30	45	6	4·2	5·9	6·5	5·9									
Oct.	1016	40	52	28			87	−11		0·8		2				3		0	39	36	5	3·3	4·9	6·0	5·1									
Nov.	1017	21	31	12			69	−41		0·7		7				5		0	20	68	7	6·9	7·2	8·1	7·1									
Dec.	1018	6	16	−4			58	−45		0·5		6				3		0	38	48	5	4·8	4·7	6·3	5·3									
Mean	1016	34	46	22															30	49	6	4·8	5·8	6·8	6·2									
Extreme or total							110	−52		15·7		10				48		22																
Number of years' observations	64	←					36									←			4						→									

Climatological Table for The Pas (Man.). Lat. 53° 49′N. Long. 101° 15′W. Altitude above MSL 890 ft.

Month	Pressure: Mean at M.S.L.	Air Temperature at Station Level: Daily Mean	Mean of daily: Max.	Mean of daily: Min.	Mean of monthly: Max.	Mean of monthly: Min.	Absolute extremes: Highest recorded	Absolute extremes: Lowest recorded	Relative Humidity: 1230 C.S.T.	Precipitation: Mean Total all forms	Precipitation: Max. fall in 24 hours	Precipitation: Mean Snowfall (in. of snow)	Number of days of: Rain, ≥ .01 in.	Number of days of: Snow, depth ≥ 1 in.	Number of days of: Frost (in screen)	Number of days of: Fog (vis. ≤ 1 km.)	Number of days of: Gale ≥ 39 m.p.h.	Number of days of: Thunder	Percentage of Time with: Clear sky (≤ 3/10 covered)	Percentage of Time with: Overcast sky (≥ 9/10 covered)	Cloud amount, tenths of sky covered: Mean for 24 hours	Cloud amount, tenths of sky covered: 0030 C.S.T.	Cloud amount, tenths of sky covered: 0630 C.S.T.	Cloud amount, tenths of sky covered: 1230 C.S.T.	Cloud amount, tenths of sky covered: 1830 C.S.T.	Wind Directions: Percentage frequencies means of 24 hourly observations daily: N	NE	E	SE	S	SW	W	NW	Calm
	mb.	°F	°F	°F	°F	°F	°F	°F	%	in.	in.	in.																						
Jan.	1018	−9	1	−18	25	−42	44	−54	93	0·6	0·50	6	<1	6	31	3	0	0	35	50	6	4·7	5·4	6·1	5·8	10	10	7	12	6	10	17	22	6
Feb.	1021	−2	10	−13	37	−37	66	−54	90	0·5	0·55	5	0	7	28	1	<1	0	33	49	6	5·2	5·8	5·8	5·7	11	15	8	13	6	11	14	16	6
Mar.	1019	11	24	−2	46	−27	59	−43	81	0·7	0·75	7	<1	7	31	1	0	0	35	46	5	4·2	5·8	5·7	5·5	11	20	7	17	7	11	9	15	2
Apr.	1017	33	45	21	66	−2	85	−21	63	0·8	0·80	5	3	3	25	1	<1	0	30	48	6	4·6	5·8	5·8	6·1	10	22	8	22	6	10	7	14	1
May	1015	48	60	36	80	21	93	13	53	1·3	1·02	1	7	1	14	1	<1	1	28	47	6	4·9	5·6	6·3	6·3	7	26	8	23	5	9	6	15	1
June	1012	59	70	48	85	34	92	25	60	2·2	1·48	0	11	0	1	2	0	3	26	44	6	5·3	5·9	6·3	6·2	10	27	8	18	5	11	5	13	3
July	1012	65	75	54	88	41	100	32	51	2·2	1·59	0	10	0	0	2	<1	7	27	37	5	3·9	5·3	5·6	6·1	11	14	8	16	6	16	10	17	2
Aug.	1013	61	72	50	85	36	96	22	54	2·1	2·69	0	10	0	0	3	0	5	26	44	6	4·2	5·9	6·1	6·1	12	14	8	15	6	15	11	17	2
Sep.	1014	49	60	38	78	26	90	19	65	1·9	3·07	<1	10	<1	4	3	<1	2	23	49	6	4·5	6·2	6·4	6·6	15	16	7	14	7	12	10	17	2
Oct.	1015	35	45	26	66	11	80	−10	71	1·1	0·62	4	7	2	18	3	<1	0	27	49	6	5·0	6·0	8·3	6·0	13	15	7	16	8	12	11	16	2
Nov.	1017	17	25	8	44	−14	58	−33	86	0·9	0·70	9	1	8	29	2	0	0	21	64	7	6·1	6·9	7·6	7·1	11	12	8	15	7	11	12	20	4
Dec.	1019	1	9	−8	34	−33	48	−51	94	0·7	0·55	8	<1	8	31	3	<1	0	36	52	6	5·4	5·1	6·2	5·6	12	10	7	15	6	10	14	21	5
Mean	1016	31	41	20					73										29	48	6	4·8	5·8	6·4	6·1	11	17	8	16	8	12	10	17	3
Extreme or total							100	−54		15·4	2·69	45	60	42	212	25	3	18																
Number of years' observations	10	←	39	→	← 27 →		← 39 →		10	39	10	39	←						9							←				12				→

POPULATION

	1956	Est. 1960
Total Population	850,040	894,000
Winnipeg (Metropolitan area)	409,121	440,600
Brandon	24,796	25,400
Portage la Prairie	10,525	11,500
Flin Flon	10,234	11,300
Selkirk	7,413	8,000
Dauphin	6,190	6,600
Percent living in urban areas		60%

ETHNIC GROUPS

Nationality	Percent Total Pop. 1951
British	46.7
Ukrainian	12.7
French	8.5
German	7.0
Netherland	5.5
Polish	4.9
Scandinavian	4.2
Indian and Eskimo	2.7
Jewish	2.4
Russian	1.1
Italian	.4
Other	3.9

ROAD DISTANCES

Winnipeg to:			
Vancouver	1,640 miles	Montreal	1,427 miles
Calgary	854 miles	Quebec City	1,679 miles
Edmonton	873 miles	Saint John	2,123 miles
Regina	365 miles	Halifax	2,422 miles
Toronto	1,306 miles	Minneapolis	458 miles
Ottawa	1,303 miles	Chicago	893 miles
		New York	1,745 miles
		San Francisco	2,208 miles

MILES OF PROVINCIAL ROADS
1960

Provincial Trunk Highways	3,777.98
Secondary Highways	267.56
(Maintenance 75% provincial.)	
Other Roads	1,705.85
Total	5,751.39

HISTORICAL AND POLITICAL

SIGNIFICANT DATES

1612—Captain Thomas Button and his crew wintered at the mouth of the Nelson River.

1619—Jens Munck expedition ran into an inlet on the west shore of Hudson Bay, now known as Churchill.

1670—Charter issued by Charles II to "The Governor and Company of Adventurers of England trading into Hudson Bay"—Port Nelson established at the mouth of the Nelson River.

1689—The first Prince of Wales fort built at Churchill.

1690—Henry Kelsey went inland from Hudson Bay to become the first white man to see the prairies.

1738—La Verendrye reached the forks of the Red and Assiniboine Rivers, the site of the present City of Winnipeg.

1770—Samuel Hearne left Prince of Wales Fort in search of Coppermine River.

1812—First party of Lord Selkirk settlers arrived at forks of Red and Assiniboine Rivers—to establish first permanent agricultural settlement in western Canada.

1816—Governor Robert Semple and 20 of his men killed by North West Company rivals at the Battle of Seven Oaks (Winnipeg).

1821—The Hudson Bay Company and the North West Company amalgamated under the name of the former.

1835—Upper Fort Garry erected by the Hudson Bay Company at forks of Red and Assiniboine Rivers (Winnipeg).

1859—The first sternwheel steamer, "Anson Northup", reached the Red River Settlement. First newspaper, "The Nor-Wester", published.

1869—Hudson's Bay Company transferred Rupert's Land to the Crown. The Red River uprising—Louis Riel seized Upper Fort Garry, formed Provisional Government.

1870—Colonel Garnet Wolseley and troops arrived at Red River. Louis Riel fled to United States. Manitoba admitted as a province into Confederation of Canada.

1873—City of Winnipeg incorporated.

1874—First detachment of the North West Mounted Police left Fort Dufferin in southern Manitoba for the Northwest Territories.

1876—First shipment of wheat left Winnipeg.

1878—Rail service began between St. Boniface, Manitoba and St. Paul, Minnesota.

1885—First train over C.P.R. line from Montreal reached Winnipeg.

1912—Present boundaries of Manitoba defined by Dominion statute. Area increased from 75,000 square miles to 250,000 square miles.

1924—Manitoba Wheat Pool organized.

1926—First pulp mill opened at Pine Falls.

1928—Hudson Bay Mining & Smelting Company began operation at Flin Flon.

1929—Hudson Bay rail line completed to Churchill.

1932—International Peace Gardens opened. Unique in conception, it comprises 2,339 acres situated astride the International Boundary Line between Manitoba and North Dakota.

1957—International Nickel Co. development begun at Moak-Mystery Lake.

1960—Atomic Energy of Canada development, on Winnipeg River, started.

PROVINCIAL POLITICAL STRUCTURE

Manitoba has a single chamber legislature composed of 57 members—36 from rural electoral divisions and 21 from urban electoral divisions. The Lieutenant-Governor, appointed by the Governor General of Canada, represents the Crown. Capital—Winnipeg.

Manitoba is represented in the bicameral federal government by 14 elected members in the House of Commons (total - 245) and by six senators appointed for life in the Senate (total - 105). The Governor General, appointed by the Queen, represents the Crown in Canada. Capital—Ottawa, Ontario.

RESOURCE UTILIZATION

AGRICULTURE
Leading crops (by value)—Wheat, oats, barley, tame hay, mixed grain, sugar beets, potatoes.

Leading crops (by acreage)—Wheat, oats, barley, tame hay, flax, mixed grain, rye.

Leading livestock products (by value)—Beef cattle, dairy products, poultry, hogs, calves, sheep.

MINING
Leading minerals (by value)—Copper, nickel, zinc, gold, silver

FORESTRY
Total cut (1957)—45,500,000 feet

Leading species cut (by volume)—White and black spruce, jack pine, poplar, balsam, fir, tamarack, white birch.

FISHERIES
Leading species caught (by value)—Pickerel, whitefish, sauger, pike.

TRAPPING
Leading species trapped (by value)—Muskrat, mink, beaver, squirrel, fox.

HYDRO-ELECTRIC POWER

Developed (1960)	990,877 h.p.
Under Construction	450,000 h.p.
Potential	6,535,500 h.p.[1]

1—80% efficiency.
80% load factor.

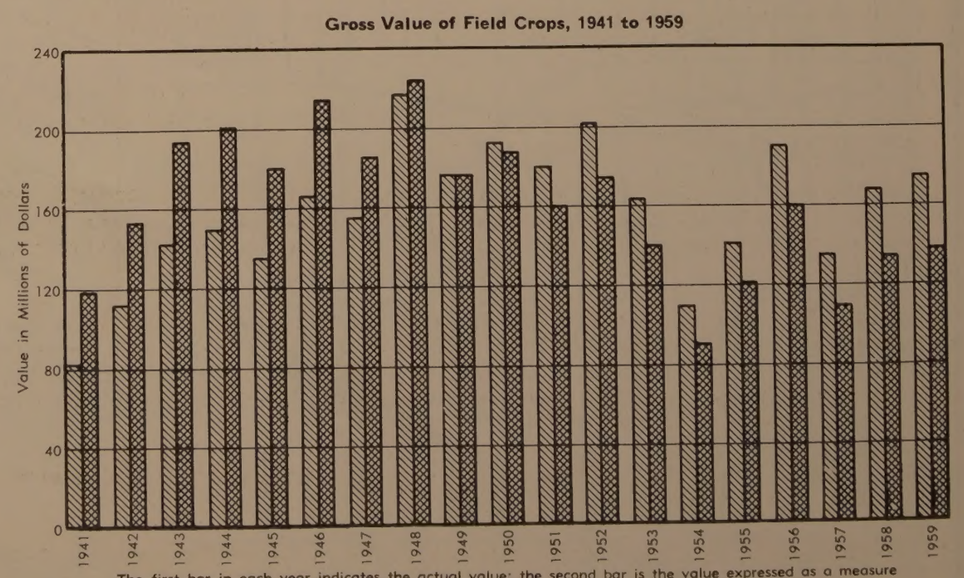
COMMODITY PRODUCING INDUSTRIES

	Estimated Gross Value of Production 1959	Percent of Total	Labour Force 1959 (est.)
Agriculture	$ 302,100,076	26.1	59,000
Forestry	16,800,000	1.4	4,400
Fishing	6,253,524	0.5	6,000
Trapping	1,517,000	0.1	6,878[1]
Mining	57,951,665	4.9	4,110
Electric Power	31,174,000	2.7	2,416
Manufacturing	743,600,000	64.3	44,100
Total	$1,159,396,265	100.0	126,904

1—Number of licenses issued.

Secondary	Estimated Gross Value of Production 1959
Manufacturing	$743,600,000
Foods and Beverages	291,900,000
Iron and Steel Products	75,600,000
Petroleum and Coal Products	61,200,000
Transportation Equipment	53,000,000
Clothing	51,800,000
Paper Products	39,400,000
Printing, Publishing and Allied Trades	38,600,000
Wood Products	33,500,000
Non-metallic Mineral Products	23,025,000
Non-ferrous Metal Products	17,100,000
Others	58,475,000
Construction	392,552,000

Gross Value of Field Crops, 1941 to 1959



The first bar in each year indicates the actual value; the second bar is the value expressed as a measure of purchasing power using Consumer's Index (1949 = 100)

GAZETTEER and GLOSSARY

GAZETTEER OF URBAN PLACES

The Gazetteer is an index of the towns and cities of the Province, giving location and population statistics for 1956 and 1960 (est.). To locate a town by means of the grid on plate 12, read along the side margin for the correct letter (e.g. A, B, etc.) and along the top or bottom margin for the correct number (1, 2, etc.). The intersection of the letter and number will locate the square in which the town is situated.

The Gazetteer listing all commercial places and urban centres with a population of 50 persons and over, exclusive of farm villages (Mennonite and Hutterite villages), Indian Reserves and rural communities. See plate 12.

Name	Map Key	Pop. 1956 D.B.S.	Est. Pop. 1960
Alexander	A2	291	300
Allegra	B6	66	50
Alonsa	B3	116	105
Altamont	A4	135	145
Altona	A5	1,698	1,900
Amaranth	B4	91	350
Anama Bay	C4	358	75
Angusville	B1	254	260
Anola	A6	68	55
Arborg	B5	762	775
Arden	B3	226	220
Argyle	B5	61	55
Arnaud	A5	95	95
Ashern	C4	417	420
Ashville	C2	85	—
Atikameg Lake Airport	E1	141	130
Aubigny	A5	141	145
Austin	A4	323	330
Bagot	A4	55	50
Baldur	A3	387	380
Balmoral	B5	121	115
Barrows	D1	98	90
Basswood	B2	114	120
Beausejour	B6	1,523	1,650
Bellsite	D1	82	95
Belmont	A3	419	430
Benito	C1	487	480
Berens River	D5	129	135
Bethany	B3	81	75
Big Eddy	E1	117	110
Binscarth	B1	452	450
Birch River	D1	722	735
Birds Hill	A5	174	180
Birnie	B3	95	90
Birtle	B1	806	810
Bissett	C7	770	785
Blumenort	A6	177	190
Boissevain	A2	1,115	1,200
Bowsman	D1	519	500
Bradwardine	A2	108	105
Brandon	A3	24,796	25,400
Briggs Spur	G1	61	55
Broad Valley	B5	66	65
Brochet	I1	145	150
Brookdale	B3	128	130
Brunkild	A5	118	125
Bruxelles	A4	53	60
Camperville	D2	592	620
Carberry	A3	1,065	1,100
Cardale	B2	86	85
Cardinal	A4	67	60
Carman	A5	1,884	1,900
Carroll	A2	78	70
Cartwright	A3	459	450
Channing	F1	509	520
Chatfield	B5	110	105
Churchill	J8	949	1,050
Clandeboye	B6	78	80
Clanwilliam	B3	188	180
Clearwater	A3	158	165
Cold Lake (Kississing)	G1	182	190
Cormorant	F2	244	250
Cowan	D2	76	70
Craigs	A6	102	105
Cranberry Portage	F1	812	950
Crandall	B2	124	120
Cromer	A1	127	170
Cross Lake	F5	149	160
Crystal City	A4	505	510
Cypress River	A3	297	300
Darlingford	A4	233	220
Dauphin	C2	6,190	6,600
Decker	B2	86	80
Deloraine	A2	900	910
Delta	B4	61	50
Dominion City	A5	583	600
Douglas	A3	241	245
Duck Bay	D2	574	620
Dufrost	A5	89	90
Dugald	A6	114	125
Dunnottar	B6	178	170
Dunrea	A3	202	195
Durban	C1	119	115
East Selkirk	B6	409	420
Eden	B3	169	155
Elgin	A2	305	310
Elie	A5	308	310
Elkhorn	A1	673	700
Elma	A7	172	165
Elm Creek	A4	341	350
Elm Grove	A6	103	95
Elphinstone	B2	376	360
Emerson	A5	896	900
Emesville	B5	97	80
Erickson	B3	488	490
Eriksdale	B4	190	195
Ethelbert	C2	505	500
Fairford	C4	51	60
Fannystelle	A5	177	170
Fisher Bay	C5	86	95
Fisher Branch	C5	374	355
Flin Flon	F1	10,234	11,300
Fork River	C2	200	180
Foxwarren	B1	270	260
Franklin	B3	91	80
Fraserwood	B5	89	85
Fullers	B6	158	150
Gardenton	A6	157	150
Garland	C2	288	275
Garson	B6	277	270
Gilbert Plains	C2	859	900
Gillam	H8	182	190
Gimli	B5	1,660	1,700
Giroux	A6	178	185
Gladstone	B4	882	900
Glenboro	A3	765	780
Glenella	B3	236	230
Glenlea	A5	50	40
Glenora	A3	65	50
Gods Lake	F8	80	90
Gonor	B6	270	280
Goodlands	A2	152	140
Grahamdale	C4	51	35
Grande Pointe	A5	139	120
Grand Rapids	E3	274	325
Grandview	C2	963	970
Great Falls	B6	150	140
Gretna	A5	603	600
Griswold	A2	153	150
Grunthal	A6	267	270
Gunton	B5	85	75
Gypsumville	C4	224	220
Hamiota	B2	690	700
Harding	A2	52	40
Hargrave	A1	51	45
Hartney	A2	554	560
Haywood	A4	145	140
Hazelridge	A6	70	75
Headingley	A5	231	245
Herb Lake	F3	65	75
High Bluff	A4	114	110
Hnausa	B5	81	65
Hodgson	C5	234	230
Holland	A4	428	490
Holmfield	A3	139	110
Horndean	A5	199	150
Howardville	C6	60	55
Howden	A5	91	95
Ile des Chenes	A5	232	220
Ilford	H7	68	60
Inglis	B1	281	270
Inwood	B5	243	250
Isabella	B2	54	40
Kelwood	B3	352	340
Kemnay	A2	54	60
Kenton	A2	236	220
Kenville	D1	151	145
Killarney	A2	1,434	1,500
Kinosota	B4	169	160
Kirkness	B6	165	175
Kleefeld	A6	98	110
Komarno	B5	105	85
La Broquerie	A6	386	365
Lac du Bonnet	B6	523	540
Landmark	A6	164	175
Langruth	B4	249	260
La Riviere	A4	232	240
La Salle	A5	138	130
Lauder	A2	91	95
Laurier	B3	307	310
Laurie River	H1	105	110
Lavenham	A4	71	65
Lenore	A2	111	105
Letellier	A5	314	310
Libau	B6	163	160
Lockport	B6	387	405
Loni Beach	B5	173	165
Loon Straight	C6	101	90
Lowe Farm	A5	385	405
Lundar	B4	647	650
Lyleton	A1	127	110
Lynn Lake	H1	1,218	1,245
Macdonald	B4	166	140
MacGregor	A4	611	630
Mafeking	D1	155	150
Makaroff	C1	62	50
Makinak	B3	105	90
Manigotogan	C6	238	220
Manitou	A4	795	800
Manson	B1	60	45
Marchand	A6	126	135
Mariapolis	A4	221	225
Marquette	B5	73	65
Mather	A3	123	130
Matheson Island	C6	166	175
McAuley	B1	160	150
McCreary	B3	563	570
Meadow Portage	C3	61	45
Medora	A2	98	90
Melita	A2	926	1,100
Miami	A4	371	380
Middlebro	A7	196	190
Middlechurch	A5	443	470
Milner Ridge	B6	63	75
Miniota	B1	268	280
Minitonas	D1	663	650
Minnedosa	B3	2,306	2,500
Minto	A2	176	160
Molson	B6	84	70
Moosehorn	C4	208	220
Moose Lake	E2	318	330
Morden	A4	2,237	3,000
Morris	A5	1,260	1,300
Napinka	A2	181	160
Narol	B5	489	510
Neelin	A3	72	60
Neepawa	B3	3,109	3,300
Nelson House	G4	57	65
Nesbitt	A3	75	65
Newdale	B2	281	270
Ninette	A3	671	660
Ninga	A3	157	135
Niverville	A5	456	470
Norway House	E5	447	450
Notre Dame de Lourdes	A4	512	510
Oakbank	A6	193	205
Oakburn	B2	402	390
Oak Lake	A2	471	480
Oak Point	B4	284	270
Oak River	B2	248	225
Oakville	A5	372	360
Ochre River	C3	332	325
Old England	B6	156	165
Onanole	B3	308	290
Otterburne	A5	172	160
Oxford House	F7	233	245
Pelican Rapids	D2	163	150
Petersfield	B6	141	135
Pierson	A1	221	205
Pikwitonei	G5	84	95
Pilot Mound	A4	785	800
Pine Dock	C6	96	80
Pine Falls	B6	1,082	1,120
Pine River	C2	351	340
Piney	A7	156	145
Pipestone	A2	251	240
Plumas	B3	340	325
Plum Coulee	A5	498	600
Point du Bois	B7	353	370
Poplarfield	B5	123	115
Poplar Point	B4	258	240
Portage la Prairie	A4	10,525	11,500
Powerview	B6	1,078	1,150
Rackham	B2	72	65
Rapid City	B2	434	420
Rathwell	A4	202	190
Red Deer Lake	D1	64	75
Reinland	A5	239	265
Rennie	A7	124	120
Reston	A1	535	545
Rice Creek	D1	70	55
Ridgeville	A5	92	80
Riding Mountain	B3	222	210
River Hills	B6	111	100
Rivers	B2	1,422	1,500
Riverton	B6	795	810
Roblin	C1	1,173	1,200
Roland	A5	468	450
Rorketon	C3	388	360
Roseisle	A4	74	65
Rosenfeld	A5	338	350
Rosenort	A5	92	100
Rossburn	B2	589	600
Rosser	A5	66	60
Russell	B1	1,227	1,300
St. Adolphe	A5	218	205
Ste. Agathe	A5	242	235
St. Ambroise	B4	316	310
Ste. Amelie	B3	67	55
Ste. Anne	A6	720	735
St. Claude	A4	530	520
St. Eustache	A5	326	320
St. George	B6	302	285
St. Jean Baptiste	A5	479	510
St. Joseph	A5	74	60
St. Laurent	B5	856	825
St. Lazare	B1	323	330
St. Leon	A4	116	110
St. Malo	A6	411	395
St. Martin	C4	54	50
St. Norbert	A5	538	720
St. Pierre	A6	838	850
Ste. Rose du Lac	C3	740	760
San Clara	C1	101	85
Sandilands	A6	127	115
Sandy Hook	B5	105	90
Sandy Lake	B2	343	335
Sanford	A5	112	110
Selkirk	B6	7,413	8,000
Seven Sisters Falls	B6	121	110
Shellmouth	B1	73	65
Sherridon	G1	88	60
Shoal Lake	B2	751	760
Shorncliffe	G5	173	160
Sidney	A3	161	150
Sifton	C2	294	270
Sinclair	A1	77	65
Skownan	C3	61	50
Snowflake	A4	83	70
Snow Lake	F2	659	690
Solsgirth	B2	82	65
Somerset	A4	540	565
Souris	A2	1,449	1,600
South Indian Lake	H3	85	95
South Junction	A7	100	95
Spearhill	C4	108	100
Sperling	A5	187	175
Sprague	A7	236	225
Springstein	A5	81	75
Starbuck	A5	258	260
Steep Rock	C4	192	180
Steinbach	A6	2,688	3,000
Stockton	A3	70	55
Stonewall	B5	1,110	1,120
Stony Mountain	B5	1,071	1,110
Strathclair	B2	461	475
Sundown	A6	162	145
Swan Lake	A4	332	340
Swan River	D1	2,644	2,800
Teulon	B5	634	680
The Pas	E1	3,971	5,000
Thicket Portage	G5	228	260
Thompson	—	—	1,000
Thornhill	A4	54	40
Tilston	A1	129	115
Tolstoi	A6	104	95
Treherne	A4	551	575
Tyndall	B6	351	365
Vassar	A7	224	210
Virden	A2	3,225	2,800
Vista	B2	72	60
Vita	A6	356	340
Vivian	A6	115	95
Wabowden	F4	284	290
Wampum	A7	52	45
Warren	B5	229	210
Wasagaming	B3	65	70
Washow Bay	C6	150	140
Waskada	A2	357	325
Wawanesa	A3	440	455
Weiden	C3	51	45
Wekusko	F3	51	60
Wellwood	B3	86	70
Westbourne	B4	161	150
Wheatland	B2	203	190
Whitemouth	A7	245	260
Winkler	A5	1,634	1,850
Winnipeg Beach	B6	805	820
Winnipegosis	C3	984	1,010
Woodlands	B5	101	85
Woodnorth	A1	54	45
Woodridge	A6	327	340

METRO WINNIPEG (1958-59)

(Metro Planning Commission)

Assiniboia	4,600
Brooklands	4,300
Charleswood	5,532
East Kildonan	23,607
East St. Paul	1,504
Ft. Garry	15,700
North Kildonan	6,000
Old Kildonan	1,100
St. Boniface	34,640
St. James	31,940
St. Vital	25,184
Transcona	11,800
Tuxedo	1,250
West Kildonan	16,990
West St. Paul	1,623
Winnipeg	257,898
	441,469

SOURCE: 1960 population estimates made by Department of Industry & Commerce, Government of Manitoba. 1956 population from Census of Canada.

RESIDENTIAL LAND CLASSIFICATION

(See Text Page 76)

Seven criteria were selected in order to differentiate between classes of residential land based on *desirability* of residence. A numerical value or index was attached to each as indicated below. The sum of values placed each block of similar dwellings in one of four major classes.

Use of Dwelling	Index
Single	4
Duplex	3
Multiple	2
Rooming	1

Age of Dwelling	Index
Post-War II	4
1930-1945	3
1918-1930	2
Before 1918	1

Number of Rooms	Index
8 and over	3
5 to 7	2
4 or less	1

Neighborhood	Index
Good	3
Fair	2
Poor	1

Condition	Index
Good	3
Fair	2
Poor	1

Lot Size	Index
75 ft. and over	4
50 to 75	3
35 to 49	2
Under 35	1

Landscaping	Index
Good	3
Fair	2
Poor	1

Classes	Total Index
Class I	19+
Class II	14 to 18
Class III	11 to 13
Class IV	10−

GLACIAL TERMINOLOGY

DRIFT: All loose material on top of bedrock is drift. Most drift is of glacial origin and consists of ground-up bedrock; but lake deposits, wind deposits and alluvium are also included.

ICE-CONTACT STRATIFIED DRIFT: This is composed of sand, gravel and silt in which the sorting is fair to poor. It is debris collected from the surface of the ice or from an englacial position by melt-water streams which later deposit it in front of the glacier in holes and tunnels within and under the ice. The distinctive features are the steep slopes that form when the ice supporting this type of deposit melts away. Eskers, kames and pitted outwash are of this material.

OUTWASH: If the meltwater streams carry glacial debris beyond the ice margin it is called outwash. It is generally gravel and sand and becomes coarser towards its source. It may form gently sloping plains or be redeposited as a valley train within a valley.

ALLUVIUM: Sediment deposited by a river is called alluvium. The particles comprising it may range in size from clay to very coarse gravel. The sorting is comparatively poor but may improve downstream where the sediment may become finer. This is the surface material on flood plains and in alluvial fans.

WATERWORKED TILL: This is the residue of sand, gravel and boulders up to about 3 feet thick formed when waves or currents remove all the silt and clay from till, as at the edge of a lake or the bottom of a river channel. In the extreme case only a layer of boulders remains on bedrock, every-thing else having been carried off. Generally a layer of boulders will form and protect the underlying till from further action.

MORAINE: This is a general term applied to deposits of till which may be further subdivided into ground moraine and end moraine.

GROUND MORAINE: Till that was deposited during the retreat of the ice margin consists mainly of lodgement till which may have a layer of superglacial till above it. There may also be a little silt and sand due to local ponds in front of the ice. The topography is undulating to gently rolling and has numerous shallow undrained depressions (sloughs). Generally there is no particular pattern to the sloughs.

END MORAINE: Deposited at the stationary edge of an ice sheet when the melting is equal to the out-flow, end moraine consists of lodgement till, superglacial till and ice-contact stratified drift. Topography is rough with many "knobs and kettles" and the slopes are steeper than in ground moraine. Typically, end moraine takes the form of a ridge up to 100 feet high and from several miles to a few hundred feet in width.

ESKERS: These are ridges of sand and gravel which are in many cases poorly sorted. They are deposits made by meltwater streams in englacial and subglacial tunnels and perhaps also in open crevasses. The crest of the ridge may be hummocky and gaps are common.

GLACIAL LAKE: If an ice margin recedes from a height of land, a basin forms between it and the higher ground in which meltwater collects. A glacial lake must have an ice margin forming one side and must receive meltwater from the glacier.

STRANDLINE: This word is used to designate the shoreline of a lake as an alternative to the word "beach". A strandline may be represented by a beach bar (a low sand or gravel ridge) or a wave-cut escarpment (the toe of the cliff is a little above the water level) or by a line separating lake deposits (silt and sand) from other deposits (ground moraine, bedrock).

ALLUVIAL FAN: When a stream with a fairly steep gradient has its gradient suddenly decreased (as at the foot of Riding Mountain) it loses some of its ability to carry sediment and drops much of its load. In doing so it chokes its own channel and shifts from side to side distributing its alluvium in a cone-shaped deposit.

DELTA: Water from a river loses its carrying power when it is discharged into the relatively quiet water of a lake. The sediment is dropped, forming a delta. Fine sediment is carried out into the lake and drops as clay and silt, but sand is deposited near the edge of the lake.

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